

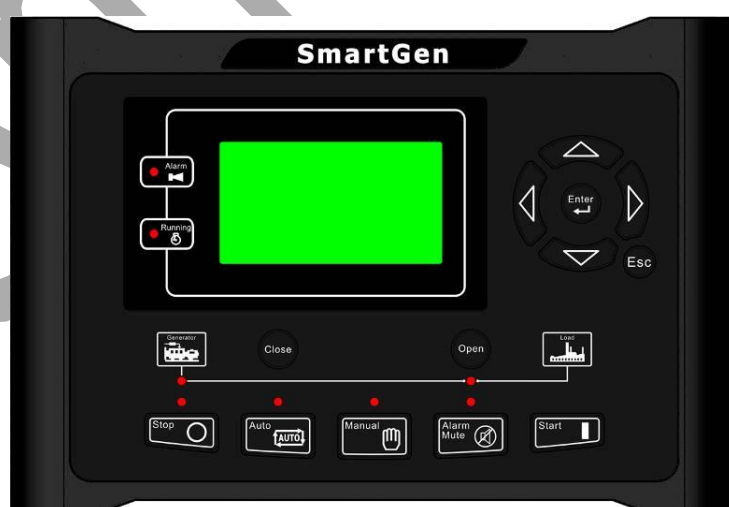
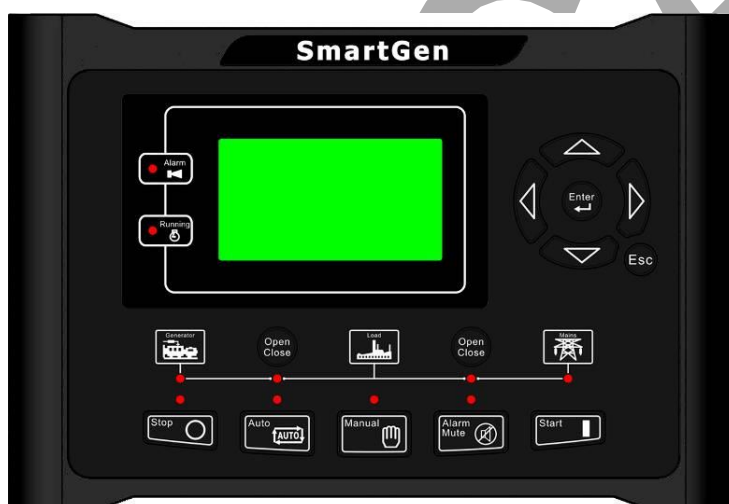


HGM9200/9300/9400 Series

(HGM9210/HGM9220/HGM9310/HGM9320/HGM9410/HGM9420)

Automatic Genset Control Module

USER MANUAL



Smartgen Technology



众智电子 Chinese trademark

Smartgen[®]

English trademark

Smartgen — make your generator *smart*

Smartgen Technology Co., Ltd.

No.28 Jinsuo Road

Zhengzhou

Henan Province

P. R. China

Tel: 0086-371-67988888/67981888

0086-371-67991553/67992951

0086-371-67981000(overseas)

Fax: 0086-371-67992952

Web: <http://www.smartgen.com.cn>

<http://www.smartgen.cn>

Email: sales@smartgen.cn

All rights reserved. No part of this publication may be reproduced in any material form (include photocopying or storing in any medium by electronic means or other) without the written permission of the copyright holder.

Applications for the copyright holder's written permission to reproduce any part of this publication should be addressed to Smartgen Technology at the address above.

Any reference to trademarked product names used within this publication is owned by their respective companies.

Smartgen Technology reserves the right to change the contents of this document without prior notice.

Software Version

Date	Version	Note
2012-03-08	1.0	Original release
2012-6-11	1.1	Modify some parameters
2013-1-14	1.2	Modify some parameters

Clarification of notation used within this publication.

SIGN	INSTRUCTION
 NOTE	Highlights an essential element of a procedure to ensure correctness.
 CAUTION!	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
 WARNING!	Indicates error operation may cause death, serious injury and significant property damage.

CONTENTS

1	SUMMARY	7
2	MODULES COMPARISON AND MODULES ABBREVIATION	7
2.1	MODULES COMPARISON	7
2.2	MODELES ABBREVIATION	8
3	PERFORMANCE AND CHARACTERISTICS	8
4	SPECIFICATION	11
5	OPERATION	12
5.1	INDICATOR LIGHT	12
5.2	KEY FUNCTIONS	13
5.3	LCD DISPLAY	14
5.3.1	Main Display	14
5.3.2	Parameters Setting Menu	16
5.4	AUTO START/STOP OPERATION	18
5.5	MANUAL START/STOP OPERATION	19
5.6	SWITCH CONTROL PROCEDURES	19
5.6.1	HGM9X20 Switch Control Procedures	19
5.6.2	HGM9X10 Switch control procedures	21
6	PROTECTION	22
6.1	WARNING	22
6.2	SHUTDOWN ALARM	24
6.3	TRIP AND SHUTDOWN ALARM	25
6.4	TRIP AND NOT SHUTDOWN ALARM	26
7	WIRINGS CONNECTION	27
8	SCOPES AND DEFINITIONS OF PROGRAMMABLE	30
8.1	CONTENTS AND SCOPES OF PARAMETERS	30
8.2	ENABLE DEFINITION OF PROGRAMMABLE OUTPUT PORTS	38
8.2.1	Defined Period Output	43
8.2.2	Defined Combination Output	44
8.3	DEFINED CONTENTS OF PROGRAMMABLE INPUT PORTS (ALL ACTIVE WHEN CONNECT TO GROUND(B-))	45

8.4	SELECTION OF SENSORS	47
8.5	CONDITIONS OF CRANK DISCONNECT SELECTION	48
9	PARAMETERS SETTING	49
10	SENSORS SETTING	49
11	COMMISSIONING	50
12	TYPICAL APPLICATION	51
13	INSTALLATION	53
14	GSM SHORT MESSAGE ALARM AND REMOTE CONTROL	54
14.1	GSM SHORT MESSAGE ALARM	54
14.2	GSM SHORT MESSAGE REMOTE CONTROL	54
15	CONNECTIONS OF CONTROLLER WITH J1939 ENGINE	56
15.1	CUMMINS ISB/ISBE	56
15.2	CUMMINS QSL9	56
15.3	CUMMINS QSM11 (IMPORT)	57
15.4	CUMMINS QSX15-CM570	57
15.5	CUMMINS GCS-MODBUS	58
15.6	CUMMINS QSM11	58
15.7	CUMMINS QSZ13	58
15.8	DETROIT DIESEL DDEC III/IV	59
15.9	DEUTZ EMR2	59
15.10	JOHN DEERE	60
15.11	MTU MDEC	60
15.12	MTU ADEC	60
15.13	MTU ADEC (SAM MODULE)	61
15.14	PERKINGS	61
15.15	SCANIA	62
15.16	VOLVO EDC3	62
15.17	VOLVO EDC4	62
15.18	VOLVO-EMS2	63
15.19	YUCHAI	63

15.20 WEICHA	64
16 FAULT FINDING	64

SmartGen

1 SUMMARY

HGM9200/9300/9400 series genset controllers are used for genset automation and monitor control system of single unit to achieve automatic start/stop, data measure, alarm protection and “three remote” (remote control, remote measuring and remote communication). The controller adopts large liquid crystal display (LCD) and selectable Chinese, English or other languages interface with easy and reliable operation.

HGM9200/9300/9400 controller adopts 32 bits micro-processor technology with precision parameters measuring, fixed value adjustment, time setting and threshold adjusting and etc. The majority of parameters can be set using front panel and all the parameters can be set using PC (via USB port) and can be adjusted and monitored with the help of RS485 and Link ports. It can be widely used in a number of automatic genset control system with compact structure, simple connections and high reliability.

2MODULES COMPARISON AND MODULES ABBREVIATION

2.1MODULES COMPARISON

		HGM 9210	HGM 9220	HGM 9310	HGM 9320	HGM 9410	HGM 9420	HGM 9610	HGM 9620	HGM 9510	HGM 9520
L	Dimen-	3.6"						4.3"			
C	sion										
D	pixel	132 x 64						320 x 200			
AMF			•		•		•		•		•
BUS Monitoring										•	
Parallel connection										•	•
Extension module								•	•		
Input Port Number		7	7	7	7	7	7	8	8	7	7
Output port Number		8	8	8	8	8	8	8	8	8	8
Sensor number		5	5	5	5	5	5	5	5	5	5
Neutral (earth) current								•	•		
Schedule function		•	•	•	•	•	•	•	•	•	•

ETHERNET							•	•		
RS485			•	•	•	•	•	•	•	•
GSM			•	•	•	•	•	•		
J1939					•	•	•	•	•	•
USB	•	•	•	•	•	•	•	•	•	•
LINK	•	•								
Real-time clock	•	•	•	•	•	•	•	•	•	•
Event log	•	•	•	•	•	•	•	•	•	•
SD card							•	•		

▲ NOTE:

(1) Two of the outputs are fixed: start output and fuel output.

(2) HGM9200/HGM9300/HGM9400's analog sensors are composed by 3 fixed sensors (temperature, pressure, liquid level) and 2 configurable sensors.

▲ NOTE: Functions of mentioned herein HGM9510/HGM9520/HGM9610/HGM9620 controllers can be changed, please check the corresponding user manual for accurate information.

2.2 MODELES ABBREVIATION

Abbreviation	Description
HGM9X20	All HGM9000 series AMF controllers
HGM9X10	All HGM9000 series ASM(Auto Start Module) controllers

▲ NOTE: HGM9000 series controller mentioned in this document refer to HGM9200/HGM9300/HGM9400 series controller particularly.

3 PERFORMANCE AND CHARACTERISTICS

HGM9X10, Auto Start Module. It controls gen-set to start or stop automatically by remote start signal.

HGM9X20, Auto Main Failure, updates based on HGM9X10, especially for automatic system composed by gens and mains.

Main characteristics,

- ◆ With ARM-based 32-bit MCU, highly integrated hardware, new reliability level;
- ◆ 132x64 LCD with backlight, multilingual interface (including English, Chinese or other languages) which can be chosen at the site, making commissioning convenient for factory personnel;
- ◆ Improved LCD wear-resistance and scratch resistance due to hard screen acrylic;

- ◆ Silicon panel and pushbuttons for better operation in high-temperature environment;
- ◆ RS485 communication port enabling remote control, remote measuring, remote communication via ModBus protocol; (controller with RS485 port only);
- ◆ Equipped with SMS (Short Message Service) function. When gen-set is alarming, controller can send short messages via SMS automatic to max. 5 telephone numbers. User can control or check gen-set by sending Short Message (controller with GSM port only);
- ◆ Equipped with CANBUS port and can communicate with J1939 genset. Not only can users monitoring frequently-used data (such as water temperature, oil pressure, speed, fuel consumption and so on) of ECU machine, but also control starting up, shutdown, raising speed and speed droop via CANBUS port. (controller with CAN BUS port only);
- ◆ Suitable for 3-phase 4-wire, 3-phase 3-wire, single phase 2-wire, and 2-phase 3-wire systems with voltage 120/240V and frequency 50/60Hz;
- ◆ Collects and shows 3-phase voltage, current, power parameter and frequency of generator or mains.

Mains

Line voltage (Uab, Ubc, and Uca)

Phase voltage (Ua, Ub, and Uc)

Phase sequence

Frequency: **Hz****Gens**

Line voltage (Uab, Ubc, and Uca)

Phase voltage (Ua, Ub, and Uc)

Phase sequence

Frequency: **Hz****Load**Current **IA, IB, IC**Each phase and total active power: **KW**Each phase and total reactive power: **KVar**Each phase and total apparent power: **KVA**Each phase and average power factor: **PF**Accumulate total gens power: **kWh, kVarh, kVAh**

- ◆ For Mains, controller has over and under voltage, over and under frequency, loss of phase and phase sequence wrong functions; For generator, controller has over and under voltage, over and under frequency, loss of phase, phase sequence wrong, over and reverse power, over current functions;
- ◆ 3 fixed analog sensors (temperature, oil pressure and liquid level);
- ◆ 2 configurable sensors can be set as sensor of temperature, pressure or fuel level;
- ◆ Precision measure and display parameters about Engine,

Temp. (WT)	°C/°F both be displayed
------------	-------------------------

Oil pressure (OP) **kPa/Psi/Bar** all be displayed

Fuel level (FL) **% (unit)**

Speed (SPD) **r/min (unit)**

Voltage of Battery (VB) **V (unit)**

Voltage of Charger (VD) **V (unit)**

Hour count (HC) can accumulate to max. 65535 hours.

Start times can accumulate to max. 65535 times

- ◆ Protection, automatic Start & Stop gen-set, ATS(Auto Transfer Switch) control with perfect fault indication and protection function;
- ◆ All output ports are relay-out;
- ◆ Parameter setting: parameters can be modified and stored in internal FLASH memory and cannot be lost even in case of power outage; most of them can be adjusted using front panel of the controller and all of them can be modified using PC via USB or RS485 ports.
- ◆ More kinds of curves of temperature, pressure, fuel level can be used directly and users can define the sensor curves by themselves;
- ◆ Multiple crank disconnect conditions (speed sensor, oil pressure, generator frequency) are optional;
- ◆ Widely power supply range DC(8~35)V, suitable to different starting battery voltage environment;
- ◆ Event log, real-time clock, scheduled start & stop generator (can be set as start gen-set once a day/week/month with load or not);
- ◆ Can be used for the pumping unit as an indicating instrument (indicate and alarm are enable only, relay is inhibited);
- ◆ With maintenance function. Actions (warning only or shutdown) can be set when maintenance time out;
- ◆ All parameters adopt digital adjustment, instead of conventional analog modulation with normal potentiometer, more reliability and stability;
- ◆ Waterproof security level IP55 due to rubber seal installed between the controller enclosure and panel fascia;
- ◆ Metal fixing clips enable perfect in high temperature environment;
- ◆ Modular design, anti-flaming ABS plastic enclosure, pluggable connection terminals and embedded installation way; compact structure with easy mounting.

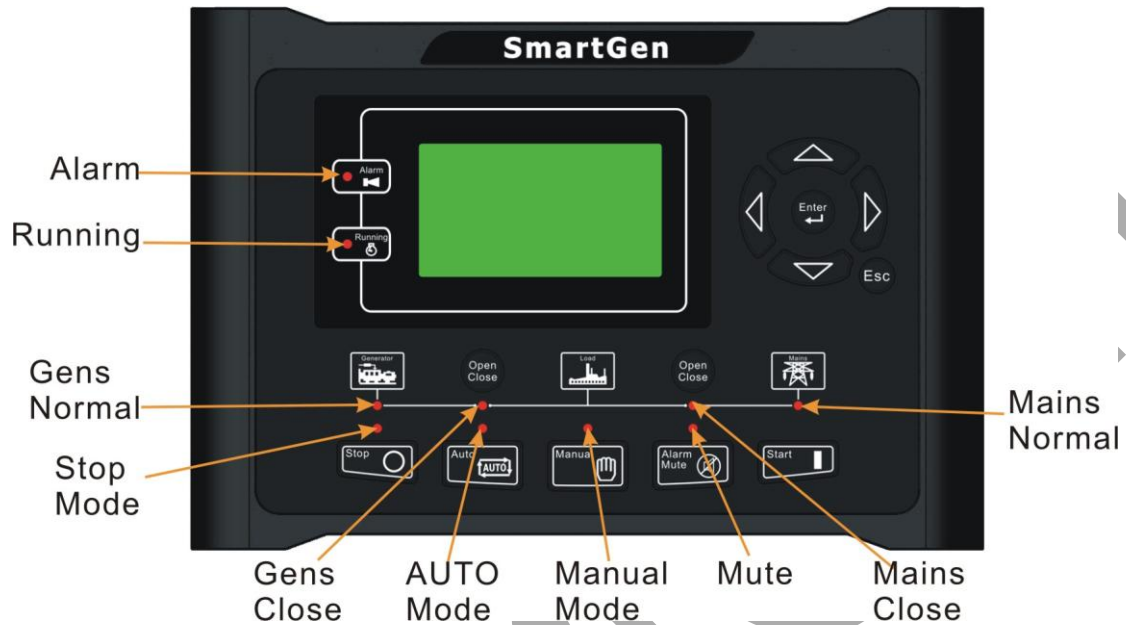
4 SPECIFICATION

Items	Contents
Operating Voltage	DC8.0V to DC35.0V , Continuous Power Supply.
Power Consumption	<4W (standby $\leq 2W$)
Alternator Input Range 3-Phase 4-Wire 3-Phase 3-Wire Single-Phase 2-Wire 2-Phase 3-Wire	AC15V-AC360V (ph-N) AC30V - AC620V (ph-ph) AC15V - AC360V (ph-N) AC15V - AC360V (ph-N)
Alternator Frequency	50/60Hz
Speed sensor voltage	1.0V to 24.0V (RMS)
Speed sensor Frequency	10,000 Hz (max.)
Start Relay Output	16 Amp DC28V
Fuel Relay Output	16 Amp DC28V
Programmable Relay Output (1)	7 Amp DC28V
Programmable Relay Output (2)	7 Amp DC28V
Programmable Relay Output (3)	7Amp DC28V
Programmable Relay Output (4)	7Amp AC250V voltage free output
Programmable Relay Output (5)	7 Amp AC250V voltage free output
Programmable Relay Output (6)	7 Amp AC250V voltage free output
Case Dimension	266mm x182mm x45mm
Panel Cutout	214mm x160mm
C.T. Secondary	5A rated
Working Conditions	Temperature: (-25~+70)°C ; Humidity: (20~93)%RH
Storage Condition	Temperature: (-30~+80)°C
Protection Level	IP55: when waterproof rubber seal installed between controller and panel fascia. IP42: when waterproof rubber seal is not installed between the controller and panel fascia.
Insulating Intensity	Object: input/output/power Quote standard: IEC688-1992 Test way: AC1.5kV/1min leakage current: 3mA
Net Weight	0.85kg

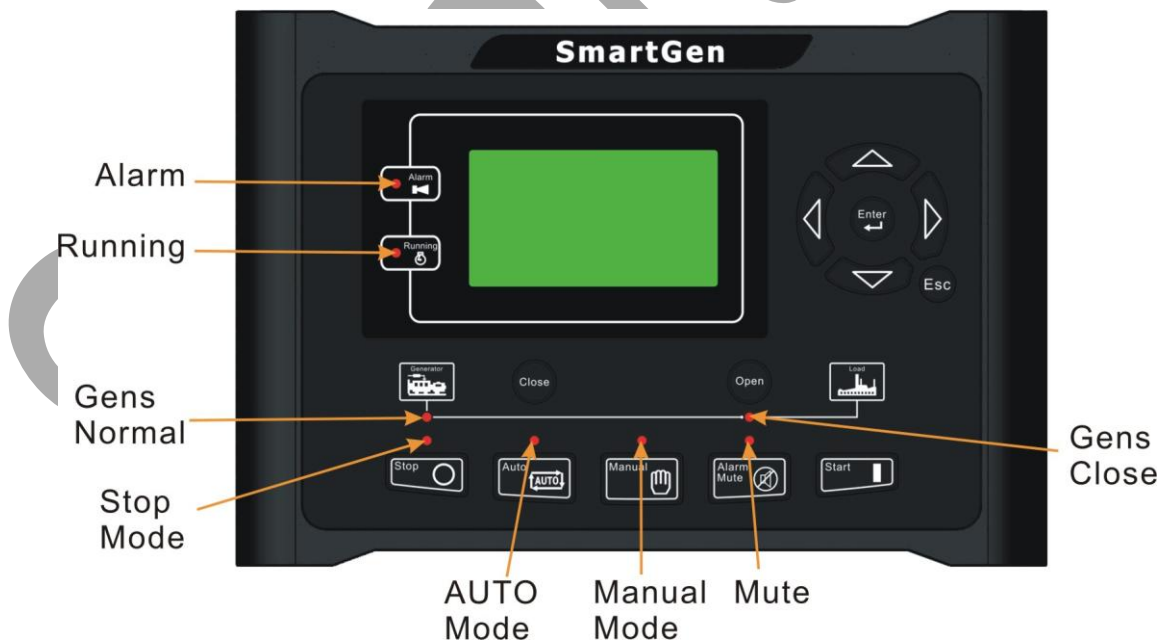
5 OPERATION

5.1 INDICATOR LIGHT

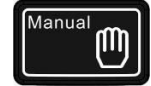
HGM9X20



HGM9X10



5.2KEY FUNCTIONS

	Stop	Stop running generator in Auto/Manual mode; Lamp test (press at least 3 seconds); Reset alarm in stop mode; During stopping process, press this button again to stop generator immediately.
	Start	Start genset in Manual mode or Test mode.
	Manual Mode	Press this key and controller enters in Manual mode.
	Auto Mode	Press this key and controller enters in Auto mode.
	Mute/ Alarm Reset	Alarming sound off; If there is trip alarm, pressing the button at least 3 seconds can reset this alarm.
	Gen Close/Open	Can control generator to switch on or off in manual mode. (HGM9X10 without)
	Mains Close/Open	Can control mains to switch on or off in manual mode (HGM9X10 without).
	Close	Can close breaker in manual mode (HGM9X20 without)
	Open	Can open breaker in manual mode (HGM9X20 without)
	Up/Increase	1) Screen scroll; 2) Up cursor and increase value in setting menu.
	Down/Decrease	1) Screen scroll; 2) Down cursor and decrease value in setting menu.
	Left	1) Screen scroll; 2) Left move cursor in setting menu.
	Right	1) Screen scroll; 2) Right move cursor in setting menu.
	Set/Confirm	1. Enters help menu; 2. Pressing and holding for more than 3 seconds enters parameter configuration menu; 3. In settings menu confirms the set value.
	Exit	1)Return to main menu; 2) Return to previous menu in setting menu

 **NOTE:** Pressing  and  simultaneously will force generator to crank. Successful start will not be judged according to crank disconnect conditions, operator will have to crank the starter motor manually; when operator decides that the engine has fired, he/she should release the button and start output will be deactivated, safety on delay will start.

 **WARNING:** Default password is 00318, user can change it in case of others change the advanced parameters setting. Please clearly remember the password after changing.

If you forget it, please contact Smartgen services and send all information in the controller page of “**ABOUT**” to us.

5.3LCD DISPLAY

5.3.1MAIN DISPLAY

Main screen is divided into left and right separate viewing areas. Both viewing areas show pages; use   to scroll the pages and   to scroll the screen.

★**Status**, including as below,

Status of gen-set, mains, and ATS

 **NOTE:** HGM9X10 has no mains status screen.

★**Engine**, including as below,

Speed, temperature of engine, engine oil pressure, liquid (fuel) level, Configure Sensor 1, Configure Sensor 2, battery voltage, charger voltage, accumulated run time, accumulated start times.

 **NOTE:** If connected with J1939 engine via CANBUS port, this page also includes: coolant pressure, coolant level, fuel temperature, fuel pressure, inlet temperature, exhaust temperature, turbo pressure, total fuel consumption and so on. (Different engine with different parameters)

★**Gen**, including as below,

Phase voltage, Line voltage, frequency, phase sequence

★**Mains**, including as below

Phase voltage, Line voltage, frequency, phase sequence

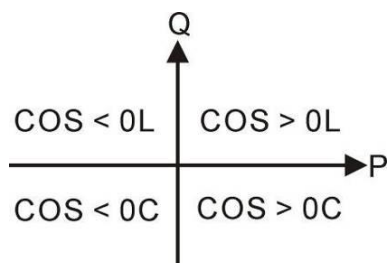
 **NOTE:** HGM9X10 has no this page.

★**Load**, including as below,

Current, each phase and total active power (positive and negative), each phase and total inactive power (positive and negative), each phase and total apparent power, each phase and average power factor (positive and negative), accumulated energy (**kWh, kVarh, kVAh**).

▲Note: When only mains indicator on, count active and inactive power, apparent power, but accumulate electric energy. Count the generator active and reactive power, apparent power, power factor, and accumulate electric energy under other conditions.

▲NOTE: Power factor shows as following,



Remark:

P stands for active power

Q stands for reactive power

Power factor	Conditions	Active power	Inactive power	Remark
$\text{COS} > 0L$	$P > 0, Q > 0$	Input	Input	Load is inductive resistance.
$\text{COS} > 0C$	$P > 0, Q < 0$	Input	Output	Load is capacitance resistance.
$\text{COS} < 0L$	$P < 0, Q > 0$	Output	Input	Load equal to one under excitation generator
$\text{COS} < 0C$	$P < 0, Q < 0$	Output	Output	Load equal to one over excitation generator.

▲Note:

1. Input active power, generator or mains send electricity to load.
2. Output active power, load send electricity to generator or mains.
3. Input reactive power, generator or mains send reactive power to load.
4. Output reactive power, load send reactive power to generator or mains.

★Alarm:

▲NOTE: For ECU alarms and shutdown alarms, if the alarm information is displayed, check engine according to it, otherwise, please check the manual of generator according to SPN alarm code.

★Event log

Records all start/stop events (shutdown alarm, trip and shutdown alarm, manual /auto start or stop) and the real time when alarm occurs.

Others, including,

Time and Date, count down time for maintenance, input/output ports status.

★About

Issue time of software and hardware version

Example:

Engine Speed	Generator-Phase Voltage
1500 RPM	L1 220V
	L2 220V
	L3 220V
Manual Mode	Battery Under Voltage

5.3.2 PARAMETERS SETTING MENU

Including as following,

- ★Mains settings
- ★Timer settings
- ★Engine settings
- ★Generator settings
- ★Load settings
- ★Switch settings
- ★Analog sensor settings
- ★Digital input settings
- ★Relay output settings
- ★Module settings
- ★Scheduling and maintenance settings
- ★GSM settings

Example,

Advanced Parameters	Form1: Use   to scroll settings,  to enter settings (form2),  to exit settings menu.
>Mains	
>Timers	
>Engine	
>Generator	

Generator	Form 2: Use   to scroll settings (Form3); Select "Return" and press  back to previous menu(form 1)  back to previous menu.(form 1)
>Return	
>AC System	
>Poles	
>Rated Voltage	

Generator >Under voltage shutdown >Over freq shutdown >Under freq shutdown >Over voltage warn	Form 3: Use   to scroll settings.  confirm setting (form4),  back to previous menu (form 1).
Over Voltage Warn Enable choice: Disable Set value: 00110% Return value: 00108% Delay: 00005	Form 4:  Enter setting menu (form5),  back to previous menu (form 3).
Over Voltage Warn Enable choice: Disable Set value: 00110% Return value: 00108% Delay : 00005	Form 5: Use   to scroll settings (form 6),  confirm setting(form 7),  exit setting (form 4).
Over Voltage Warn Enable choice: Enable Setting value: 00110% Return value: 00108% Time lag : 00005	Form 6: Use   to scroll settings (form 5),  confirm setting (form7),  exit setting (Form4).
Over Voltage Warn Enable choice: Enable Setting value: 00110% Return value: 00108% Time lag: 00005	Form7:   Change cursor position,   change cursor value,  confirm setting,  exit setting (form 4).
Over Voltage Warn Enable choice: Disable Setting value: 00110% Return value: 00108% Time lag: 00005	Form 8:   Change cursor position,   change cursor value,  Confirm setting (form 4),  exit setting (form 4) .

 **NOTE:** Long time pressing  can exit setting directly during setting.

5.4 AUTO START/STOP OPERATION



Press , its indicator lights, and controller enters **Auto** mode.

Starting Sequence,

1. **HGM9X20:** When Mains is abnormal (over and under voltage, over and under frequency, loss of phase, phase sequence wrong), it enters into mains “abnormal delay” and LCD display count down time. When mains abnormal delay is over, it enters into “start delay”; it also enters into this mode when “remote start on load” is active.
2. **HGM9X10:** Generator enters into “start delay” as soon as “Remote Start on Load” is active.
3. Start Delay timer is shown at the bottom line of LCD.
4. When start delay is over, preheat relay outputs (if this be configured), “preheat start delay XX s” is shown at the bottom line of LCD.
5. When preheat delay is over, fuel relay outputs 1s and then start relay output; if engine crank fails during “cranking time”, the fuel relay and start relay deactivated and enter into “crank rest time” and wait for next crank.
6. If generator crank fails within setting times, controller will send “**Fail to start**” and the warning will be shown on LCD at the same time.
7. In case of successful crank attempt, “safety on timer” starts. During this period, low oil pressure, high water temperature, under speed, charge failure alarms are disabled. As soon as this delay is over, “start idle delay” is initiated (if configured).
8. During “start idle delay”, under speed, under frequency, under voltage alarms are inhibited. When this delay is over, “warming up delay” starts (if configured).
9. When “warming up delay” is over, if generator state is normal, its indicator will be illuminated. If voltage and frequency has reached on-load requirements, the closing relay will be energised, generator will accept load, generator power indicator will turn on, and generator will enter Normal Running state; if voltage and frequency are abnormal, the controller will initiate alarm (alarm type will be displayed on LCD alarm page).

▲NOTE: In case of “Remote Start (off Load)”, the procedure is the same, except for step NO.

9: the closing relay will NOT be energised, generator will NOT accept load.

Stopping Sequence:

1. when mains return normal during gen-set running, enters into mains voltage “Normal delay”. When mains normal delay are over, enter into “stop delay” and mains indicator lights; also can be into this mode when “remote start on load” is inactive.

2. HGM9X10, generator enters into “stop delay” as soon as “Remote Start” is inactive.
3. When stop delay is over, close generator relay is un-energized; generator enters into “cooling time relay”. After “transfer rest time”, close mains relay is energized. Generator indicator extinguishes while mains indicator lights.
4. Idle relay is energized as soon as entering “stop idle delay”.
5. If enter “ETS hold delay”, ETS relay is energized. Fuel relay is deactivated and decides whether generator is stopped or not automatically.
6. Then enter gen-set “Completely stop time”, auto decides whether generator is stopped or not automatically.
7. Enter “after vstop time” (if configured) as soon as generator stops. Otherwise, controller will send “Fail to stop” alarm. (If gen-set stopped successfully after warning of “Failed to Stop”, it will enter “after stop time” and remove alarm)
8. Enter “generator standby” as soon as “over stop time” is over.

5.5 MANUAL START/STOP OPERATION

1. MANUAL START: Press , controller enters into Manual mode and its indicator lights. Press  to start generator, can automatically detect crank disconnected, and generator accelerates to high-speed running automatically. With high temperature, low oil pressure and abnormal voltage during generator running, controller can protect genset to stop quickly. Press  (HGM9X20) or  and  (HGM9X10) to control switch on or off. (please refer to No.4~9 of Auto start operation for detail procedures, the procedure is same, except for switch open ways and close ways are different)
2. MANUAL STOP: Press  can stop the running generators. (please refer to No.3~8 of Auto stop operation for detail procedures).

▲ NOTE: In “manual mode”, the procedures of ATS please refer to corresponding contents in this manual.

5.6 SWITCH CONTROL PROCEDURES

5.6.1 HGM9X20 SWITCH CONTROL PROCEDURES

Manual transfer procedures

When controller is in **Manual** mode, the switch control procedures will start through manual transfer.

Users can control the loading transfer of ATS via pressing button to switch on or off.

A. If “Open breaker detect” is “SELECT Disable”

Press generator switch on or off key , if generator has taken load, will send unload signal; if taken no load, generator will send load signal; if mains has taken load, mains will unload, and then generator will take load.

Press mains switch on or off key , if mains has taken load, will send unload signal; if taken no load, mains will send load signal; if generator has taken load, generator will unload, and then mains will take load.

B. If “Open breaker detect” is “SELECT Enable”

To transfer load from mains to generator need to press mains switch off key  firstly. After switch off delay, press generator switch on key , and generator will take load (there is no action when pressing switch on key directly).

The way to transfer from generator to mains is as same as above.

Auto transfer procedures:

When controller is in AUTO Test, switch control procedures will start through automatic transfer.

1. If input port is connected with closing breaker signal

A. If “Open breaker detect” is “SELECT Enable”

When transferring load from mains to gens, controller begins detecting “fail to transfer”, then the open delay and transfer rest delay will begin. When detecting time out, the gens will not switch on if switch open failed, otherwise, gens switch on. Detecting transfer failure while gens switch on. When detecting time out, if switch on fail, it is need to wait for gens to switch on. If transfer failed and warning “SELECT Enable”, there is alarming signal whatever switch on or off failure.

The way to transfer from gens load to mains load is as same as above.

B. If “Open breaker detect” is “SELECT Disable”

Mains load is transferred into gens load, after the delay of switch off and transfer interval, gens switch on. Detecting transfer fail while gens switch on. After detecting time out, if switch on fail, then wait for gens switch on. If transfer fail and warning “SELECT Enable”, there is alarming signal.

2. If input port is not connected with closing breaker input

Mains load be transferred into gens load, after switch off and transfer interval delay, gens switch on.

The way to transfer gens load to mains load is as same as above.

5.6.2 HGM9X10 SWITCH CONTROL PROCEDURES

Manual control procedures,

When controller is in Manual mode, manual control will be executive.

Users can control switch on or off by pressing corresponding key.

Press generator switch on key , generator will output load signal. Press gens switch off key , generator will output unload signal.

Auto control procedures,

When controller is in auto mode, switch control procedures will start auto transfer.

1. If input port is configured as Close Mains Auxiliary

A. If “Open breaker detect” is “SELECT Enable”

Generator load is transferred into generator un-load, after the delay of switch off, detecting transfer failure while switch off output. When detecting time out, if switch off failed, it will wait for switch off. Otherwise, switch off is completed.

Generator unload is transferred into generator load, after the close delay, detecting transfer failure while switch on outputting. When detecting time out, if switch on failed, it will wait for switch on. Otherwise, switch on is completed.

If transfer failed and warning “SELECT Enable”, there is alarming signal whatever switch on or off failure.

B. If “Open breaker detect” is “SELECT Disable”

Generator load is transferred into generator unload, after the delay of switch off, switch off is completed.

Gens unload is transferred into gens load, after the delay of switch on, detecting transfer failure while switch on outputting. When detecting time out, if switch on failed, to wait for switch on. Otherwise, switch on is completed.

If transfer failure warning is “SELECT Enable”, there is warning signal that “switch on fail”.

2. If input port is not connected with closing breaker signal

Generator un-load is transferred into generator load, generator switch on and output.

Generator load is transferred into generator un-load, generator switch off and output.



NOTE:

When using ATS of no interposition, switch off detecting is “SELECT Disable”;

When using ATS of having interposition, switch off “SELECT Disable” or “SELECT Enable” are both OK. If choose “SELECT Enable”, switch off output should be configured;

When using AC contactor, switch off “SELECT Enable” recommended.

6 PROTECTION

6.1 WARNINGS

When controller detects the warning signal, alarm only and not stop gen-set.

Warnings as following,

No.	Type	Description
1	Over Speed Warn	When controller detects the speed is higher than the set value, it will send warn signal.
2	Under Speed Warn	When controller detects the speed is lower than the set value, it will send warn signal.
3	Loss of Speed Warn	When controller detects the speed is 0 and the action select “Warn”, it will send warn signal.
4	Over Frequency Warn	When controller detects the frequency is higher than the set value, it will send warn signal.
5	Under Frequency Warn	When controller detects the frequency is lower than the set value, it will send warn signal.
6	Over Voltage Warn	When controller detects the voltage is higher than the set value, it will send warn signal.
7	Under Voltage Warn	When controller detects the voltage is lower than the set value, it will send warn signal.
8	Over Current Warn	When controller detects the current is higher than the set value, it will send warn signal.
9	Fail to Stop	When generator not stops after the “stop delay” is over.
10	Charge Alt Fail	When controller detects the charger voltage is lower than the set value, it will send warn signal.
11	Battery Over Voltage	When controller detects the battery voltage is higher than the set value, it will send warn signal.
12	Battery Under Voltage	When controller detects the battery voltage is lower than the set value, it will send warn signal.
13	Maintenance Due	When count down time is 0 and the action select “Warn”, it will send warn signal.
14	Reverse Power	When controller detects the reverse power value (power is negative) is lower than the set value, it will send warn signal.
15	Over Power	When controller detects the reverse power value (power is positive) is higher than the set value, it will send warn signal.

No.	Type	Description
16	ECU Warn	When controller gets the alarm signal from engine via J1939, it will send warn signal.
17	Gen Loss of Phase	When controller detects the generator loss phase, it will send warn signal.
18	Gen Phase Sequence Wrong	When controller detects the reverse phase, it will send warn signal.
19	Switch Fail Warn	When controller detects the switch on and off fail, and the action select enable, it will send warn signal.
20	Temp. Sensor Open	When controller detects the sensor is open circuit, and the action select "warn", it will send warn signal.
21	High Temp. Warn	When controller detects the temperature is higher than the set value, it will send warn signal.
22	Low Temp. Warn	When controller detects the temperature is lower than the set value, it will send warn signal.
23	Pressure Sensor Open	When controller detects the sensor is open circuit, and the action select "warn", it will send warn signal.
24	Low OP Warn	When controller detects the oil pressure is lower than the set value, it will send warn signal.
25	Level Sensor Open	When controller detects the sensor is open circuit, and the action select "warn", it will send warn signal.
26	Low Level Warn	When controller detects the oil level is lower than the set value, it will send warn signal.
27	Flexible Sensor 1 Open	When controller detects the sensor is open circuit, and the action select "warn", it will send warn signal.
28	Flexible Sensor 1 High	When controller detects the sensor value is higher than the max. set value, it will send warn signal.
29	Flexible Sensor 1 Low	When controller detects the sensor value is lower than the min. set value, it will send warn signal.
30	Flexible Sensor 2 Open	When controller detects the sensor is open circuit, and the action select "warn", it will send warn signal.
31	Flexible Sensor 2 High	When controller detects the sensor value is higher than the max. set value, it will send warn signal.
32	Flexible Sensor 2 Low	When controller detects the sensor value is lower than the min. set value, it will send warn signal.
33	Digital Input Warn	When digit input port is set as warning and active, controller sends corresponding warning signal.

No.	Type	Description
34	GSM Com Fail Warning	When select GSM enable but the controller couldn't detect GSM model, controller sends corresponding warning signal.

6.2 SHUTDOWN ALARM

When controller detects shutdown alarm, it will send signal to stop the generator.

Shutdown alarms as following,

No.	Type	Description
1	Emergency Stop	When controller detects emergency stop signal, it will send a stop signal.
2	Over Speed	When controller detects the speed value is higher than the set value, it will send a stop signal.
3	Under Speed	When controller detects the speed value is lower than the set value, it will send a stop signal.
4	Loss Of Speed Signal	When controller detects speed value equals to 0, and the action select "Shutdown", it will send a stop alarm signal.
5	Over Frequency	When controller detects the frequency value is higher than the set value, it will send a stop signal.
6	Under Frequency	When controller detects the frequency value is lower than the set value, it will send a stop signal.
7	Over Voltage	When controller detects the voltage value is higher than the set value, it will send a stop signal.
8	Under Voltage	When controller detects the voltage value is lower than the set value, it will send a stop signal.
9	Fail To Start	If genset start fail within setting of start times, controller will send a stop signal.
10	Over Current	When controller detects the current value is higher than the set value, it will send a stop signal.
11	Maintenance Due	When count down time is 0 and the action select "Shutown", it will send a stop alarm signal.
12	ECU shutdown	When controller gets stop signal from engine via J1939, it will send a stop signal.
13	ECU Com Fail	When controller NOT gets data from engine via J1939, it will send a stop signal.
14	Reverse Power Shutdown	When controller detects reverse power value (power is negative) is lower than the set value, and the reverse power action select "shutdown", it will send a stop alarm signal.

No.	Type	Description
15	Over Power Shutdown	When controller detects reverse power value (power is positive) is higher than the set value, and the reverse power action select “shutdown”, it will send a stop signal.
16	Temp. Sensor Open	When controller detects sensor is open circuit, and the action select “shutdown”, it will send a stop signal.
17	High Temp. Shutdown	When controller detects temperature is higher than the set value, it will send a stop signal.
18	Pressure Sensor Open	When controller detects sensor is open circuit, and the action select “shutdown”, it will send a stop signal.
19	Low OP Shutdown	When controller detects oil pressure is lower than the set value, it will send a stop signal.
20	Level Sensor Open	When controller detects sensor is open circuit, and the action select “shutdown”, it will send a stop signal.
21	Flexible Sensor 1 Open	When controller detects sensor is open circuit, and the action select “shutdown”, it will send a stop signal.
22	Flexible Sensor 1 High	When controller detects the sensor value is higher than the max. set value, it will send stop signal.
23	Flexible Sensor 1 Low	When controller detects the sensor value is lower than the min. set value, it will send stop signal.
24	Flexible Sensor 2 Open	When controller detects sensor is open circuit, and the action select “shutdown”, it will send a stop signal.
25	Flexible Sensor 2 High	When controller detects the sensor value is higher than the max. set value, it will send stop signal.
26	Flexible Sensor 2 Low	When controller detects the sensor value is lower than the min. set value, it will send stop signal.
27	Digital Input Port	When digital input port is set as shutdown, and the action is active, it will send a shutdown signal.

6.3 TRIP AND SHUTDOWN ALARM

When controller detects shutdown alarm signal, it will shutdown generator quickly and stop after high speed cooling.

Trips shutdown alarm as following,

No.	Type	Description
1	Over Current	When controller detects the value is higher than the set value, and the action select “trip and shutdown”, it will send trip and stop signal.

No.	Type	Description
2	Maintenance Due	When count down time is 0 and the action select “trip and shutdown”, it will send a trip and stop signal.
3	Reverse Power	When controller detects reverse power value (power is negative) is lower than the set value, and the action select “trip and shutdown”, it will send a trip and stop signal.
4	Over Power	When controller detects the over power value (power is positive) is higher than the set value, and the action select “trip and shutdown”, it will send a trip and stop signal.
5	Digital Input Ports	When digital input port is set as “trip and shutdown”, and the action is active, it will send a trip and stop signal.

6.4TRIP ALARM

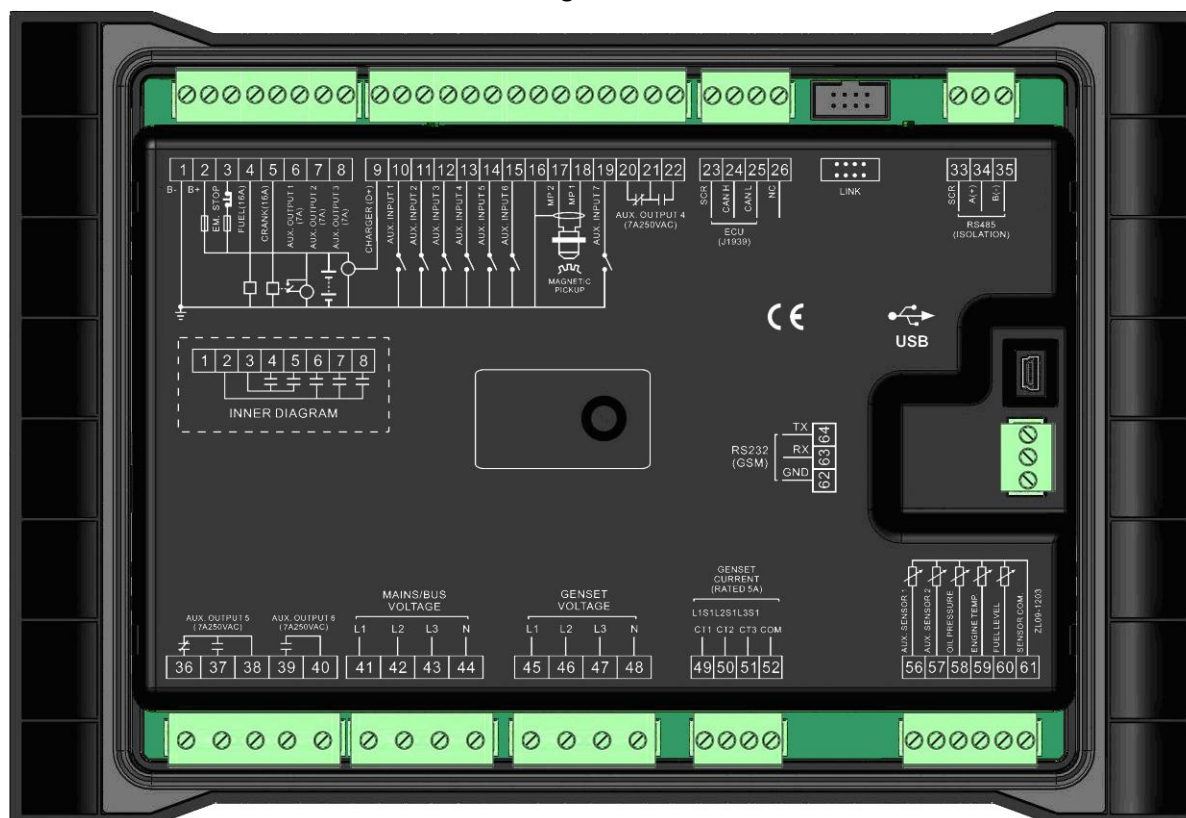
When controller detects stop alarm, it will break close generator signal quickly, but genset not stop.

Trip and not stop alarm as following,

No.	Type	Description
1	Over Current	When controller detects the value is higher than the set value, and the action select “trip”, it will send trip signal.
2	Reverse Power	When controller detects reverse power value (power is negative) is lower than the set value, and the action select “trip”, it will send a trip signal.
3	Over Power	When controller detects the over power value (power is positive) is higher than the set value, and the action select “trip”, it will send a trip signal.
4	Digital Input Ports	When digital input port is set as “trip”, and the action is active, it will send a trip signal.

7 WIRINGS CONNECTION

HGM9000 series controller's rear as following:



Description of terminal connection:

NO.	Functions	Cable Size	Remark	
1	DC input B-	2.5mm ²	Connect to negative of starter battery.	
2	DC input B+	2.5mm ²	Connect to positive of starter battery. If wire length is over 30m, better to double wires in parallel. Max. 20A fuse recommended.	
3	Emergency stop	2.5mm ²	Connect to B+ via emergency stop button.	
4	Fuel relay output	1.5mm ²	B+ is supplied by 3 points, rated 16A.	
5	Start relay output	1.5mm ²	B+ is supplied by 3 points, rated 16A.	Connected to coil of starter
6	Aux. Output 1	1.5mm ²	B+ is supplied by 2 points, rated 7A.	Details see form 2
7	Aux. Output 2	1.5mm ²	B+ is supplied by 2 points, rated 7A.	
8	Aux. Output 3	1.5mm ²	B+ is supplied by 2 points, rated 7A.	
9	Charger(D+)	1.0mm ²	Connect to charge generator's D+ (WL) terminals. Being hang up If there is no the terminal.	

HGM9200/9300/9400 Series Gen-set Controller

NO.	Functions	Cable Size	Remark
10	Aux. Input 1	1.0mm ²	Ground connected is active (B-).
11	Aux. Input 2	1.0mm ²	Ground connected is active (B-).
12	Aux. Input 3	1.0mm ²	Ground connected is active (B-).
13	Aux. Input 4	1.0mm ²	Ground connected is active (B-).
14	Aux. Input 5	1.0mm ²	Ground connected is active (B-).
15	Aux. Input 6	1.0mm ²	Ground connected is active (B-).
16	Magnetic Pickup	0.5mm ²	Connect to Speed sensor, shielding line is recommended. (B-) has already connected with speed sensor 2
17	Magnetic Pickup 2		
18	Magnetic Pickup 1		
19	Aux. Input 7	1.0mm ²	Ground connected is active (B-).
20	Aux. Output 4	1.5mm ²	Normally close outputs, rated 7A.
21			Public points of relay
22			Normally open outputs, rated 7A
23	ECU CAN	/	Impedance-120Ω shielding wire is recommended, its single-end earthed (controllers without ECU CAN function have no this terminal).
24	ECU CAN H	0.5mm ²	
25	ECU CAN L	0.5mm ²	
26	NC	/	Empty terminal
33	RS485	/	Impedance-120Ω shielding wire is recommended, its single-end earthed. (controllers without RS485 function have no this terminal).
34	RS485-	0.5mm ²	
35	RS485+	0.5mm ²	
36	Aux. Output 5	2.5mm ²	Normally close outputs, rated 7A.
37		2.5mm ²	Normally open outputs, rated 7A.
38		2.5mm ²	Public points of relay
39	Aux. Output 6	2.5mm ²	Normally open outputs, rated 7A.
40		2.5mm ²	Public points of relay
41	Mains A-phase voltage sensing input	1.0mm ²	Connect to A-phase of mains (2A fuse is recommended) (HGM9X10 without).

HGM9200/9300/9400 Series Gen-set Controller

NO.	Functions	Cable Size	Remark	
42	Mains B-phase voltage sensing input	1.0mm ²	Connect to B-phase of mains (2A fuse is recommended) (HGM9X10 without).	
43	Mains C-phase voltage sensing input	1.0mm ²	Connect to C-phase of mains (2A fuse is recommended) (HGM9X10 without).	
44	Mains N-wire input	1.0mm ²	Connected to N-wire of mains (HGM9x10 without)	
45	Genset A-phase voltage sensing input	1.0mm ²	Connect to A-phase of gen-set (2A fuse is recommended).	
46	Genset B-phase voltage sensing input	1.0mm ²	Connect to B-phase of gen-set (2A fuse is recommended).	
47	Genset C-phase voltage sensing input	1.0mm ²	Connect to C-phase of gen-set (2A fuse is recommended).	
48	Gen-set N-wire input	1.0mm ²	Connected to N-wire of gen-set	
49	CT A-phase sensing input	1.5mm ²	Outside connected to secondary coil of current transformer(rated 5A)	
50	CT B-phase sensing input	1.5mm ²	Outside connected to secondary coil of current transformer(rated 5A)	
51	CT C-phase sensing input	1.5mm ²	Outside connected to secondary coil of current transformer(rated 5A)	
52	CT COM	1.5mm ²	See following installation instructions.	
56	Aux. sensor 1	1.0mm ²	Connect to temperature, oil pressure or fuel level sensors.	Details see form 4
57	Aux. sensor 2	1.0mm ²		
58	Oil pressure sensor	1.0mm ²		
59	Temperature sensor	1.0mm ²		
60	Fuel level sensor	1.0mm ²	Connect to fuel level sensor.	
61	Sensor COM	/	Public terminals of sensor, (B-) have already connected.	
62	RS232	0.5mm ²	Connect to GSM module. (controllers without GSM function don't have this terminal)	
63	RS232 RX	0.5mm ²		
64	RS232 TX	0.5mm ²		



NOTE: USB ports in controller rear panel are programmable parameter ports, user can directly configure controller via PC. When the unit use CAN port communication with gen-set

(gen-set is not the conventional type), it only in shutdown mode and in standby mode can use the USB port to configure parameters.

▲NOTE: LINK ports in controller rear panel are programmable parameters ports; user can program SG72 via PC directly. (Only HGM9210/HGM9210 with this port)

▲NOTE: Please refer to the [MODULES COMPARISON](#) in this manual for more products' functions.

8 SCOPES AND DEFINITIONS OF CONFIGURABLE PARAMETERS

8.1 CONTENTS AND SCOPES OF PARAMETERS

Form 1

No.	Items	Parameters	Defaults	Description
Mains Setting				
1	AC System	(0~3)	0	0: 3P4W ; 1: 3P3W ; 2: 2P3W ; 3: 1P2W .
2	Rated Voltage	(30~30000)V	230	Standard for checking mains over/under voltage. (It is primary voltage when using voltage transformer).
3	Rated Frequency	(10.0~75.0)Hz	50.0	Standard for checking mains over/under frequency.
4	Normal Time	(0~3600)s	10	The delay from mains abnormal to normal.
5	Abnormal Time	(0~3600)s	5	The delay from mains normal to abnormal.
6	Volt. Trans.(PT)	(0~1)	0	0: Disable ; 1: Enable
7	Over Voltage	(0~200)%	120	Setting value is mains rated voltage's percentage, and return value and delay value also can be set.
8	Under Voltage	(0~200)%	80	
9	Over Frequency	(0~200)%	114	Setting value is mains rated frequency's percentage, return value and delay value also can be set.
10	Under Frequency	(0~200)%	90	
11	Loss of Phase	(0~1)	1	0: Disable; 1: Enable
12	Reverse Phase	(0~1)	1	

No.	Items	Parameters	Defaults	Description
Timer Setting				
1	Start Delay	(0~3600)s	1	Time from mains abnormal or remote start signal is active to start gen-set.
2	Stop Delay	(0~3600)s	1	Time from mains normal or remote start signal is inactive to gen-set stop.
3	Preheat Delay	(0~3600)s	0	Time of pre-powering heat plug before starter is powered up.
4	Cranking Time	(3~60)s	8	Time of starter power up
5	Crank Rest Time	(3~60)s	10	The waiting time before second power up when engine start fail.
6	Safety Delay On	(0~3600)s	10	Alarms for low oil pressure, high temperature, under speed, under frequency/voltage, charge fail are inactive.
7	Start Idle Time	(0~3600)s	0	Idle running time of genset when starting.
8	Warming Up Time	(0~3600)s	10	Warming time between genset switch on and high speed running.
9	Cooling Time	(0~3600)s	10	Radiating time before genset stop, after it unloads.
10	Stop Idle Time	(0~3600)s	0	Idle running time when genset stop.
11	ETS Solenoid Hold	(0~3600)s	20	Stop electromagnet's power on time when genset is stopping.
12	Fail to Stop Delay	(0~3600)s	0	Time between over of genset idle delay and stopped when "ETS time" is set as 0; Time between over of ETS hold delay and stopped when "ETS Hold output time" is not 0.
13	After Stop Time	(0~3600)s	0	Time between genset stopped and standby
Engine Setting				
1	Engine Type	(0~39)	0	Default: Conventional genset (not J1939) When connected to J1939 engine, choose the corresponding type.
2	Flywheel Teeth	(10~300)	118	Tooth number of the engine, for judging of starter separation

No.	Items	Parameters	Defaults	Description
				conditions and inspecting of engine speed. See the installation instructions.
3	Rated Speed	(0~6000) RPM	1500	Offer standard to judge over/under/loading speed.
4	Speed on Load	(0~100)%	90	Setting value is percentage of rated speed. Controller detects when it is ready to load. It won't switch on when speed is under loading speed.
5	Loss Of Speed Signal	(0~3600)s	5	Time from detecting speed is 0 to confirm the action.
6	Loss Of Speed Action	(0~1)	0	0:Warn; 1:Shutdown
7	Over Speed Shutdown	(0~200)%	114	Setting value is percentage of rated speed and delay value also can be set.
8	Under Speed Shutdown	(0~200)%	80	
9	Over Speed Warn	(0~200)%	110	Setting value is percentage of rated speed and delay & return values also can be set.
10	Under Speed Warn	(0~200)%	86	
11	Battery Rated Voltage	(0~60.0)V	24.0	Standard for detecting over/under voltage of battery.
12	Battery Over Volts	(0~200)%	120	Setting value is percentage of rated voltage of battery and delay & return values also can be set.
13	Battery Under Volts	(0~200)%	85	
14	Charge Alt Fail	(0~60.0)V	8.0	In normal running, when charger D+(WL) voltage under this value, charge failure alarms.
15	Start Attempts	(1~10) times	3	Max. Crank times of crank attempts. When reach this number, controller will send start failure signal.
16	Crank Disconnect	(0~6)	2	See form 5 There are 3 conditions of disconnecting starter with engine. Each condition can be used alone and simultaneously to separating the start motor and genset as soon as possible.
17	Disconnect Generator	(0~200)%	24	When generator frequency higher than the set value, starter will be

No.	Items	Parameters	Defaults	Description
	Freq			disconnected. See the installation instruction.
18	Disconnect Engine Speed	(0~200)%	24	When generator speed higher than the set value, starter will be disconnected. See the installation instruction.
19	Disconnect Oil Pressure	(0~1000)kPa	200	When generator oil pressure higher than the set value, starter will be disconnected. See the installation instruction.
Generator Setting				
1	AC System	(0~3)	0	0: 3P4W ; 1: 3P3W ; 2: 2P3W ; 3: 1P2W .
2	Poles	(2~16)	4	Numbers of generator pole, used for calculating starter rotate speed when without speed sensor.
3	Rated Voltage	(30~30000)V	230	To offer standards for detecting of gens' over/under voltage and loading voltage. (It is primary voltage when using voltage transformer; it is line voltage when AC system is 3P3W while it is phase voltage when using other AC system).
4	Loading Voltage	(0~200)%	85	Setting value is percentage of generator rated voltage. When gens voltage under load voltage, won't enter into normally running, during the period of when controller ready to detect loading.
5	Rated Frequency	(10.0~600.0)Hz	50.0	To offer standards for detecting of over/under/load frequency.
6	Loading Frequency	(0~200)%	85	Setting value is percentage of generator rated frequency. When generator frequency under load frequency, it won't enter into normal running.
7	Volt. Trans.(PT)	(0~1)	0	0: Disable; 1: Enable
8	Over Volt. Shutdown	(0~200)%	120	Setting value is percentage of generator rated volt. Delay value also

No.	Items	Parameters	Defaults	Description
9	Under Volt. Shutdown	(0~200)%	80	can be set.
10	Over Freq. Shutdown	(0~200)%	114	Setting value is percentage of generator rated freq. Delay value also can be set.
11	Under Freq. Shutdown	(0~200)%	80	
12	Over Volt. Warn	(0~200)%	110	Setting value is percentage of generator rated volt. Delay and return value also can be set.
13	Under Volt. Warn	(0~200)%	84	
14	Over Freq. Warn	(0~200)%	110	Setting value is percentage of gens rated freq. Delay and return value also can be set.
15	Under Freq. Warn	(0~200)%	84	
16	Loss of Phase	(0~1)	1	0: Disable 1: Enable
17	Phase Sequence Wrong	(0~1)	1	
Load Setting				
1	Current Trans.	(5~6000)/5	500	The ratio of external CT
2	Full Current Rating	(5~6000)A	500	Generator's rated current, standard of load current.
3	Full kW rating	(0~6000)kW	276	Generator's rated power, standard of load power.
4	Over Current	(0~200)%	120	Setting value is percentage of generator rated volt. Delay value also can be set.
5	Over Power	(0~1)	0	0: Disable 1: Enable.
6	Reverse Power	(0~1)	0	0: Disable 1: Enable.
Switch Setting				
1	Transfer Time	(0~7200)s	5	Interval time from mains switch off to generator switch on; or from generator switch off to mains switch on.
2	Close Time	(0~20.0)s	5.0	Pulse width of mains/generator switch on. When it is 0, means output constantly.
3	Open Time	(0~20.0)s	3.0	Pulse width of mains/generator switch

No.	Items	Parameters	Defaults	Description
				off.
4	Check Time	(0~20.0)s	5.0	Time of detecting switch auxiliary contacts after transferred.
5	Warn Enable	(0~1)	0	0: Disable 1: Enable.
6	Check Enable	(0~1)	0	0: Disable 1: Enable.
7	Enable Immediate Mains Dropout	(0~1)	1	0: Disable 1: Enable.
Module Setting				
1	Power on Mode	(0~2)	0	0: Stop mode 1: Manual mode 2: Auto mode
2	Module Address	(1~254)	1	Controller's address during remote sensing.
3	Stop Bits	(0~1)	0	0: 2 stop bits; 1: 1 stop bit
4	Language	(0~2)	0	0: Simplified Chinese 1: English 2: Others
5	Password	(0~65535)	00318	It is used for entering advanced parameters setting.
GSM Setting				
1	GSM Enable	(0~1)	0	0: Disable; 1: Enable
2	Phone Number	Max. 20 digits		Its national and area's cods must be added. e.g. China: 8613666666666
Scheduling And Maintenance Setting				
1	Scheduled Run	(0~1)	0	0: Disable; 1: Enable
2	Scheduled Not Run	(0~1)	0	0: Disable; 1: Enable
3	Maintenance	(0~1)	0	0: Disable; 1: Enable
Analog Sensors Setting				
Temperature Sensor				
1	Curve Types	(0~15)	7	SGX. See form 5.
2	Open Circuit Action	(0~2)	0	0: Warn; 1: Shutdown; 2: No action
3	High Temp. Shutdown	(0~300)°C	98	Shutdown when sensor temperature higher than this value. Detecting only after safety delay is over. The delay value also can be set.
4	High Temp. Warn	(0~300)°C	95	Warn when sensor temperature higher than this value. Detecting only after safety delay is over. The delay and

No.	Items	Parameters	Defaults	Description
				return value also can be set.
5	Low Temp. Warn	(0~1)	0	0: Disable; 1: Enable
Oil Pressure Sensor				
1	Curve Types	(0~15)	7	SGX See form 5.
2	Open Circuit Action	(0~2)	0	0: Warn 1: Shutdown 2: No action
3	Low OP Shutdown	(0~1000)kPa	103	Shutdown when oil pressure higher than this value. Detecting only after safety delay is over. The delay value also can be set.
4	Low OP Warn	(0~1000)kPa	124	Warn when oil pressure higher than this value. Detecting only after safety delay is over. The delay and return value also can be set.
Liquid Level Sensor				
1	Curve Types	(0~15)	4	SGH See form 5
2	Open Circuit Action	(0~2)	0	0:Warn; 1:Shutdown; 2:No action
3	Low Level Warn	(0~300)%	10	Warn when level lower than this value. It is detecting all the time. The delay and return value also can be set.
Flexible Sensor 1				
1	Flexible Sensor Setting 1	(0~1)	0	0: Disable 1: Enable; (can be set as temperature/pressure/liquid lever sensor).
Flexible Sensor 2				
1	Flexible Sensor Setting 2	(0~1)	0	0: Disable; 1: Enable; (can be set as temperature/pressure/liquid lever sensor).
Flexible Input Ports				
Flexible Input Port 1				
1	Contents Setting	(0~50)	28	Remote start (on load). See form 3
2	Active Type	(0~1)	0	0: Closed to active 1: Open to active
Flexible Input Port 2				
1	Contents Setting	(0~50)	26	High temperature shutdown See form 3
2	Active Type	(0~1)	0	0: Closed to active

HGM9200/9300/9400 Series Gen-set Controller

No.	Items	Parameters	Defaults	Description
				1: Open to active
Flexible Input Port 3				
1	Contents Setting	(0~50)	27	Low oil pressure shutdown See form 3
2	Active Type	(0~1)	0	0: Closed active 1: Open active
Flexible Input Port 4				
1	Contents Setting	(0~50)	0	User defined. See form 3
2	Active Type	(0~1)	0	0: Closed to active 1: Open to active
3	Arming	(0~3)	2	0: From safety on 1: From starting 2: Always 3:Never
4	Active Actions	(0~4)	0	0: Warn; 1: Shutdown; 2:Trip and stop 3:Trip 4: Indication
5	Active Delay	(0~20.0)s	2.0	Time from detecting active to confirm
6	Description			LCD display detailed contents when the input is active.
Flexible Input Port 5				
1	Contents Setting	(0~50)	0	User defined. See form 3
2	Active Type	(0~1)	0	0: Closed to active 1: Open to active
3	Arming	(0~3)	2	0: From safety on 1: From starting 2: Always 3:Never
4	Active Actions	(0~4)	1	0: Warn; 1: Shutdown; 2:Trip and stop 3:Trip 4: Indication
5	Active Delay	(0~20.0)s	2.0	Time from detecting active to confirm
6	Description			LCD display detailed contents when the input is active.
Flexible Input Port 6				
1	Contents Setting	(0~50)	0	User defined .See form 3
2	Active Type	(0~1)	0	0: Closed to active 1: Open to active
3	Arming	(0~3)	2	0: From safety on 1: From starting 2: Always 3:Never
4	Active Actions	(0~4)	2	0: Warn; 1: Shutdown; 2:Trip and stop 3:Trip 4: Indication
5	Active Delay	(0~20.0)s	2.0	Time from detecting active to confirm
6	Description			LCD display detailed contents when the input is active.

No.	Items	Parameters	Defaults	Description
Flexible Input Port 7				
1	Contents Setting	(0~50)	5	Lamp test. See form 3
2	Active Type	(0~1)	0	0: Closed to active 1: Open to active
Flexible Output Ports				
Flexible Output Port 1				
1	Contents Setting	(0~239)	1	User defined period output (default output is in preheating) See Form 4
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Flexible Output Port 2				
1	Contents Setting	(0~239)	35	Idle control output. See Form 4
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Flexible Output Port 3				
1	Contents Setting	(0~239)	29	Gen closed output. See form 4
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Flexible Output Port 4				
1	Contents Setting	(0~239)	31	Mains closed output. See form 4
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Flexible Output Port 5				
1	Contents Setting	(0~239)	38	ETS solenoid hold. See form 4
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close
Programmable Output Port 6				
1	Contents Setting	(0~239)	48	Common alarm. See form 4
2	Active Type	(0~1)	0	0: Normally open; 1: Normally close

8.2ENABLE DEFINITION OF PROGRAMMABLE OUTPUT PORTS

Form 2

No.	Type	Description
0	Not Used	Details of function description please see the following.
1	Custom Period 1	
2	Custom Period 2	
3	Custom Period 3	
4	Custom Period 4	
5	Custom Period 5	

HGM9200/9300/9400 Series Gen-set Controller

6	Custom Period 6	
7	Custom Combined 1	
8	Custom Combined 2	
9	Custom Combined 3	
10	Custom Combined 4	
11	Custom Combined 5	
12	Custom Combined 6	
13	Reserved	
14	Reserved	
15	Reserved	
16	Reserved	
17	Air Flap	Action when over speed shutdown and emergence stop. It also can close the air inflow to stop the engine as soon as possible.
18	Audible Alarm	Action when warning, shutdown, trips. Can be connected annunciator externally. When "alarm mute" configurable input port is active, it can remove the alarm.
19	Louver Control	Action in genset starting and disconnect when genset stopped completely.
20	Fuel Pump Control	It is controlled by fuel pump of level sensor's limited threshold.
21	Heater Control	It is controlled by heating of temperature sensor's setting threshold.
22	Cooler Control	It is controlled by cooler of temperature sensor's setting threshold.
23	Oil Pre-supply Output	Action from "crank on" to "safety on".
24	Excite Generator	Output in start period. If there is no gens frequency during hi-speed running, output for 2 seconds again.
25	Pre-Lubricate	Actions in period of pre-heating to safety run.
26	Remote PC Output	This port is controlled by communication (PC).
27	GSM Power	Power for GSM module (GSM module is reset when GSM communication failed).
28	Reserved	

HGM9200/9300/9400 Series Gen-set Controller

29	Close Generator	Control generator to take load.
30	Open Breaker	Control generator to off load.
31	Close Mains	Control mains to take load.
32	Reserved	
33	Start Relay	
34	Fuel Relay	Action when genset is starting and disconnect when stop is completed.
35	Idle Control	Used for engine which has idles. Close before starting and open in warming up delay; Close during stopping idle mode and open when stop is completed.
36	Raise Speed	Action in warming up delay.
37	Drop Speed	Action between the period from "stop idle" to "failed to stop".
38	ETS Control	Used for engines with ETS electromagnet. Close when stop idle is over and open when pre-set "ETS delay" is over.
39	Pulse drop speed	Active 0.1s when it enters into shutdown idling, used for control part of ECU dropping to idle.
40	ECU Stop	Used for ECU engine and control its stop.
41	ECU Power	Used for ECU engine and control its power.
42	Pulse raise speed	Active 0.1s when controller enter into warming up delay; used for control part of ECU raising to normal speed.
43	Crank Success	Close when detects a successful start signal.
44	Generator OK	Action when gens are normal.
45	Generator Available	Action in period of gens ok to hi-speed cooling.
46	Mains OK	Action when mains normal.
47	Reserved	
48	Common Alarm	Action when genset common warning, common shutdown, common trips alarm.
49	Common Trip and Stop	Action when common trip and stop alarm.
50	Common Shutdown	Action when common shutdown alarm.

HGM9200/9300/9400 Series Gen-set Controller

51	Common Trip Alarm	Action when common trips alarm.
52	Common Warn Alarm	Action in common warning alarm.
53	Reserved	
54	Battery High Volts	Action when battery's over voltage warning alarm.
55	Battery Low Volts	Action when battery's low voltage warning alarm.
56	Charge Alt Fail	Action when charge fail warning alarms.
57	Reserved	
58	Reserved	
59	Reserved	
60	ECU Warn	Indicate ECU sends a warning signal.
61	ECU Shutdown	Indicate ECU sends a shutdown signal.
62	ECU Com Fail	Indicate controller not communicates with ECU.
63	Reserved	
64	Reserved	
65	Reserved	
66	Reserved	
67	Reserved	
68	Reserved	
69	Aux Input 1 Active	Action when input port 1 is active.
70	Aux Input 2 Active	Action when input port 2 is active.
71	Aux Input 3 Active	Action when input port 3 is active.
72	Aux Input 4 Active	Action when input port 4 is active.
73	Aux Input 5 Active	Action when input port 5 is active.
74	Aux Input 6 Active	Action when input port 6 is active.
75	Aux Input 7 Active	Action when input port 7 is active.
76~ 98	Reserved	
99	Emergency Stop	Action when emergency stop alarm.
100	Fail To Start	Action when failed start alarm.
101	Fail To Stop	Action when failed stop alarm.
102	Under Speed Warn	Action when under speed alarm.
103	Under Speed Shutdown	Action when under speed shuts down.
104	Over Speed Warn	Action when over speed warn.
105	Over Speed Shutdown	Action when over speed shutdown alarm.
106	Reserved	
107	Reserved	
108	Reserved	

HGM9200/9300/9400 Series Gen-set Controller

109	Gen over frequency Warn	Action when generator over frequency warning.
110	Gen over frequency Shut	Action when generator over frequency shutdown alarm.
111	Gen Over Volt Warn	Action when generator over voltage warning.
112	Gen Over Volt Shut	Action when generator over voltage shutdown.
113	Gen Under Freq. Warn	Action when generator low frequency warning.
114	Gen Under Freq. Shut	Action when generator low frequency shutdown.
115	Gen Under Volt. Warn	Action when generator low voltage warning.
116	Gen Under Volt. Shut	Action when generator low voltage shutdown.
117	Gen Loss of Phase	Action when gens loss phase.
118	Gen Reverse Phase	Action when generator reverse phase.
119	Reserved	
120	Over Power	Action when controller detects generator have over power.
121	Reserved	
122	Reverse Power	Action when controller detects gens' reverse power.
123	Over Current	Action when over current.
124	Reserved	
125	Mains Inactive	
126	Mains Over Freq	
127	Mains Over Volt	
128	Mains Under Freq	
129	Mains Under Volt	
130	Mains Reverse Phase	
131	Mains Loss of Phase	
132~138	Reserved	
139	High Temp. Warn	Action when hi-temperature warning.
140	Low Temp Warn	Action when low temperature warning.
141	High Temp Shutdown	Action when high temperature Shutdown alarm.
142	Reserved	
143	Low OP Warn	Action when low oil pressure warning.
144	Low OP Shutdown	Action when low oil pressure shutdown.

145	OP Sensor Open	Action when oil pressure sensor is open circuit.
146	Reserved	
147	Low Level Warn	Action when controller has low oil level alarm.
148	Reserved	
149	Reserved	
150	Config1 High Warn	
151	Config1 Low Warn	
152	Config1 High Shut	
153	Config1 Low Shut	
154	Config2 High Warn	
155	Config2 Low Warn	
156	Config2 High Shut	
157	Config2 Low Shut	
158~229	Reserved	
230	Stop Mode	Action in stop mode.
231	Manual Mode	Action in Manual mode.
232	Test Mode	Action in Manual test mode.
233	Auto Mode	Action in Auto mode.
234	Generator On Load	
235	Mains On Load	
236	Reserved	
237	Reserved	
238	Reserved	
239	Reserved	

8.2.1 DEFINED PERIOD OUTPUT

Defined Period output is composed by 2 parts, period output S1 and condition output S2.



While S1 and S2 are **TRUE** synchronously, OUTPUT;

While S1 or S2 is **FALSE**, NOT OUTPUT.

Period output S1: can set generator's one or more period output freely, can set the delayed time and output time after enter into period.

Condition output S2: can set as any conditions in output ports.

NOTE: when delay time and output time both are 0 in period output S1, it is **TRUE** in this period.

Example,

Output period: Start

Delay output time: 2s

Output time: 3s

Condition output contents: Output port 1 is active

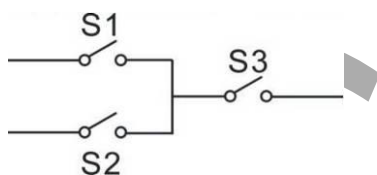
Close when condition output active/inactive: close when active (disconnect when inactive);

Output port 1 active, after enter “starts time” and delay 2s, this defined period output is outputting, after 3s, stop outputting;

Output port 1 inactive, defined output period is not outputting.

8.2.2 DEFINED COMBINATION OUTPUT

Defined combination output is composed by 3 parts, condition output S1 or S2 and condition output S3.



S1 or S2 is **TRUE**, while S3 is **TRUE**, Defined combination output is outputting;

S1 and S2 are **FALSE**, or S3 is **FALSE**, Defined combination output is not outputting.

▲**NOTE:** S1, S2, S3 can be set as any contents except for “defined combination output” in the output setting.

▲**NOTE:** 3 parts of defined combination output (S1, S2, S3) couldn't include or recursively include themselves.

Example,

Contents of probably condition output S1: output port 1 is active;

Close when probably condition output S1 is active /inactive: close when active (disconnect when inactive);

Contents of probably condition output S2, output port 2 is active;

Close when probably condition output S2 is active /inactive: close when active (disconnect when inactive);

Contents of probably condition output S3: output port 3 is active;

Close when probably condition output S3 is active /inactive: close when active (disconnect when inactive);

When input port 1 active or input port 2 active, if input port 3 is active, Defined combination output is outputting; If input port 3 inactive, Defined combination output is not outputting;

When input port 1 inactive and input port 2 inactive, whatever input port 3 is active or not, Defined combination output is not outputting.

8.3 DEFINED CONTENTS OF CONFIGURABLE INPUT PORTS (ALL ACTIVE WHEN CONNECT TO GROUND (B-))

Form 3

No.	Type	Description
0	Users Configured	Including following functions, Indication: indicate only, not warning or shutdown. Warning: warn only, not shutdown. Shutdown: alarm and shutdown immediately Trip and stop: alarm, generator unloads and shutdown after hi-speed cooling Trip: alarm, generator unloads but not shutdown. Never: input inactive. Always: input is active all the time. From crank: detecting as soon as start. From safety on: detecting after safety on run delay.
1	Reserved	
2	Alarm Mute	Can prohibit "Audible Alarm" output when input is active.
3	Reset Alarm	Can reset shutdown alarm and trip alarm when input is active.
4	60HZ Active	Use for CANBUS engine and it is 60Hz when input is active.
5	Lamp Test	All LED indicators are illuminating when input is active.
6	Panel Lock	All buttons in panel is inactive except  and there is  in the left of first row in LCD when input is active.
7	Reserved	
8	Idle Control Mode	Under voltage/frequency/speed protection is inactive.
9	Inhibit Auto Stop	In Auto mode, during generator normal running, when input is active, prohibit generator shutdown automatically.
10	Inhibit Auto Start	In Auto mode, prohibit generator start automatically when input is active.
11	Inhibit Scheduled	In Auto mode, prohibit fixed timing start genset when input is active.
12	Reserved	
13	Aux Gen Closed	Connect generator loading switch's Aux. Point.
14	Inhibit Gen Load	Prohibit genset switch on when input is active.
15	Aux Mains Closed	Connect mains loading switch's Aux. Point.

16	Inhibit Mains Load	Prohibit mains switch on when input is active.
17	Auto Mode Lock	When input is active, controller enters into Auto mode; all the keys except  are inactive, and  will show in the first line of LCD display.
18	Auto Mode Invalid	When input is active, controller won't work under Auto mode.  key and simulate auto key input does not work.
19	Reserved	
20	Reserved	
21	Inhibit Alarm Stop	All shutdown alarms are prohibited except emergence stop.(Means battle mode or override mode)
22	Aux Instrument Mode	All outputs are prohibited in this mode.
23	Reserved	
24	Reset Maintenance	Controller will set maintenance time and date as default when input is active.
25	Reserved	
26	Aux. High Temp	Connected sensor digital input.
27	Aux. Low OP	Connected sensor digital input.
28	Remote Start (On Load)	In Auto mode, when input active, genset can be started and with load after genset is OK; when input inactive, genset will stop automatically.
29	Remote Start (Off Load)	In Auto mode, when input is active, genset can be started and without load after genset is OK; when input is inactive, genset will stop automatically.
30	Aux. Manual Start	In Auto mode, when input active, genset will start automatically; when input inactive, genset will stop automatically
31	Reserved	
32	Reserved	
33	Simulate Stop key	An external button can be connected and pressed as simulate panel.
34	Simulate Manual key	
35	Reserve	
36	Simulate Auto key	An external button can be connected and pressed as simulate panel.
37	Simulate Start key	
38	Simulate G-Load key	This is simulate G-close key when HGM9610 controller is applied.
39	Simulate M-Load key	This is simulate M-open key when HGM9610

		controller is applied.
40	Reserved	
41	Reserved	
42	Reserved	
43	Reserved	
44	Reserved	
45	Aux Mains OK	In Auto mode, mains are normal when input is active.
46	Aux Mains Fail	In Auto mode, mains are abnormal when input is active.
47	Alternative Config1	Users can set different parameters to make it easy to select current configuration via input port.
48	Alternative Config2	
49	Alternative Config3	
50	Reserved	

8.4 SELECTION OF SENSORS

Form4

No.	Content	Description	Remark
1	Temperature Sensor	0 Not used 1 Custom Res Curve 2 Custom 4-20mA curve 3 VDO 4 CURTIS 5 VOLVO-EC 6 DATCON 7 SGX 8 SGD 9 SGH 10 PT100 11~15 Reserved	Defined resistance's range is 0~6KΩ, default is SGX sensor.
2	Pressure Sensor	0 Not used 1 Custom Res Curve 2 Custom 4-20mA curve 3 VDO 10Bar 4 CURTIS 5 VOLVO-EC 6 DATCON 10Bar 7 SGX 8 SGD 9 SGH 10~15 Reserved	Defined resistance's range is 0~6KΩ, default is SGX sensor.

No.	Content	Description	Remark
3	Oil Level Sensor	0 Not used 1 Custom Res Curve 2 Custom 4-20mA curve 3 SGD 4 SGH 5~15 Reserved	Defined resistance's range is 0~6KΩ, default is SGH sensor.

NOTE: User should make special declare when order controller if your gen-set equip with sensor of 4~20mA.

8.5 CONDITIONS OF CRANK DISCONNECT SELECTION

No.	Setting description
0	Gen frequency
1	Speed sensor
2	Speed sensor + Gen frequency
3	Oil pressure
4	Oil pressure + Gen frequency
5	Oil pressure + Speed sensor
6	Oil pressure + Speed sensor + Gen frequency

NOTE:

- There are 3 conditions to make starter disconnected with engine, that is, speed sensor, generator frequency and engine oil pressure. They all can be used separately. We recommend that engine oil pressure should be using with speed sensor and generator frequency together, in order to make the starter motor is separated with engine immediately and can check crank disconnect exactly.
- Speed sensor is the magnetic equipment which be installed in starter for detecting flywheel teeth.
- When set as speed sensor, must ensure that the number of flywheel teeth is as same as setting, otherwise, "over speed stop" or "under speed stop" may be caused.
- If genset without speed sensor, please don't select corresponding items, otherwise, "start fail" or "loss speed signal" maybe caused.
- If genset without oil pressure sensor, please don't select corresponding items.
- If not select generator in crank disconnect setting, controller will not collect and display the relative power quantity (can be used in water pump set); if not select speed sensor in crank disconnect setting, the rotating speed displayed in controller is calculated by generator frequency and number of poles.

9 PARAMETERS SETTING

In **HGM9x10** series controller, there are no items of mains in setting and also no mains items in configurable ports of input/output.

⚠CAUTION: Please change the controller parameters when generator is in standby mode only (e. g. Start conditions selection, configurable input, configurable output, various delay), otherwise, alarming to stop and other abnormal conditions may happen.

⚠NOTE: Maximum set value must over minimum set value in case that the condition of too high as well as too low will happen.

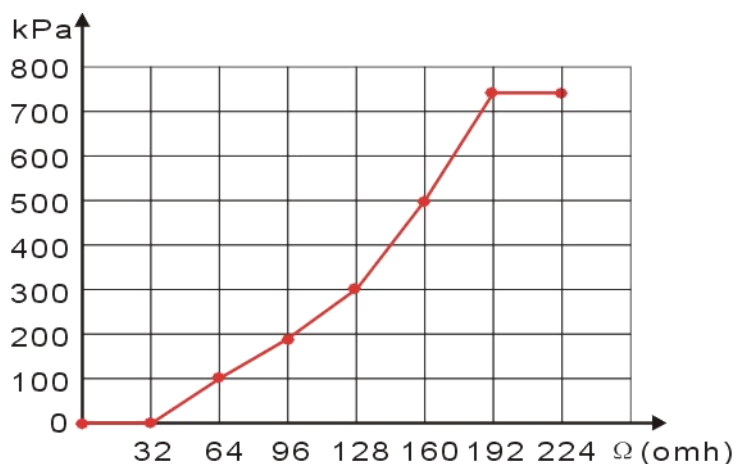
⚠NOTE: When setting the warning alarm, please set the correct return value; otherwise, maybe there is abnormal alarm. When setting the maximum value, the return value must less than setting; When setting the minimum value, the return value must over setting.

⚠NOTE: Please set the generator frequency value as low as possible when cranking, in order to make the starter be separated quickly as soon as crank disconnect.

⚠NOTE: Configurable input could not be set as same items; otherwise, there are abnormal functions. However, the configurable output can be set as same items.

10 SENSORS SETTING

1. When reselect sensors, the sensor curve will be transferred into the standard value. For example, if temperature sensor is SGX (120°C resistor type), its sensor curve is SGX (120°C resistor type); if select the SGD (120°C resistor type), the temperature sensor curve is SGD curve.
2. When there is difference between standard sensor curves and using sensor, user can adjust it in “curve type”.
3. When input the sensor curve, X value (resistor) must be input from small to large, otherwise, mistake occurs.
4. If select sensor type as “None”, sensor curve is not working.
5. If corresponding sensor has alarm switch only, user must set this sensor as “None”, otherwise, maybe there is shutdown or warning.
6. The headmost or backmost values in the vertical coordinates can be set as same as below,



Normal Pressure Unit Conversion Form

	pa	kgf/cm ²	bar	psi
1Pa	1	1.02×10^{-5}	1×10^{-5}	1.45×10^{-4}
1kgf/cm ²	9.8×10^4	1	0.98	14.2
1bar	1×10^5	1.02	1	14.5
1psi	6.89×10^3	7.03×10^{-2}	6.89×10^{-2}	1

11 COMMISSIONING

Please make the under procedures checking before commissioning,

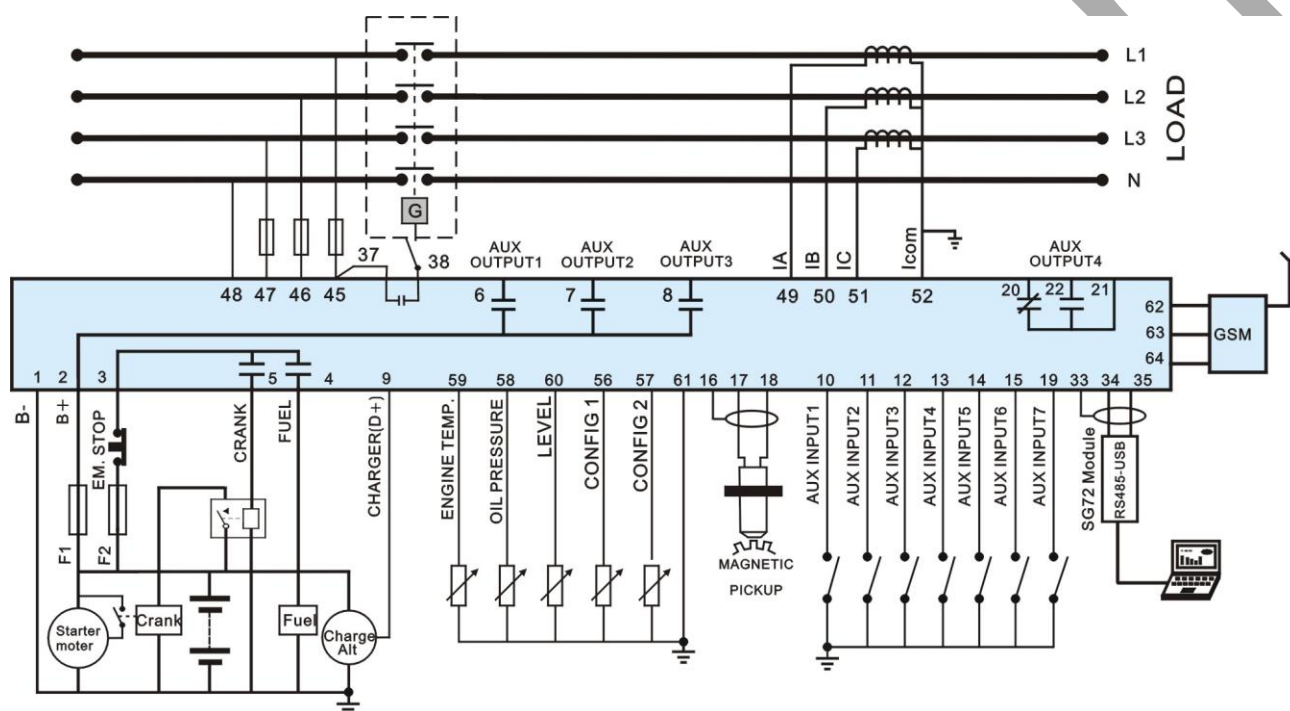
1. Ensure all the connections are correct and wires diameter is suitable.
2. Ensure that the controller DC power has fuse, controller's positive and negative connected to start battery are correct.
3. Emergence stop must be connected with positive of start battery via scram button's normal close point and fuse.
4. Take proper action to prevent engine to crank disconnect (e. g. Remove the connection wire of fuel valve). If checking is OK, make the start battery power on; choose manual mode and controller will executive routine.
5. Set controller under manual mode, press "start" button, genset will start. After the setting times as setting, controller will send signal of Start Fail; then press "stop" to reset controller.
6. Recover the action of stop engine start (e. g. Connect wire of fuel valve), press start button again, genset will start. If everything goes well, genset will normal run after idle running (if idle run be set). During this time, please watch for engine's running situations and AC generator's voltage and frequency. If abnormal, stop genset running and check all wires connection according to this manual.
7. Select the **AUTO** mode from controller's panel, connect mains signal. After the mains normal delay, controller will transfer ATS (if fitted) into mains load. After cooling time,

controller will stop genset and make it into "at rest" mode until there is abnormal of mains.

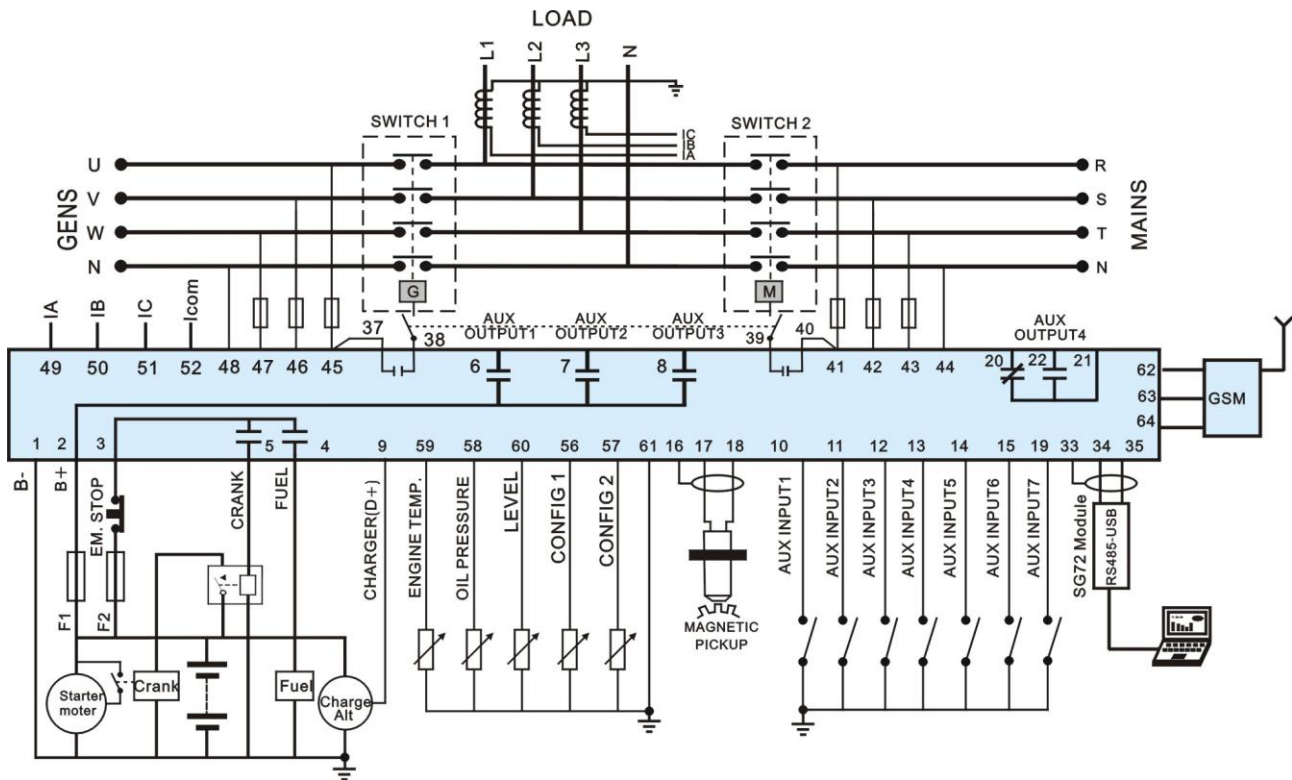
8. When mains is abnormal again, genset will be started automatically and into normal running, then controller send signal to making generator switch on, and control the ATS as generator load. If not like this, please check ATS' wires connection of control part according to this manual.
9. If there is any other question, please contact Smartgen's service.

12 TYPICAL APPLICATION

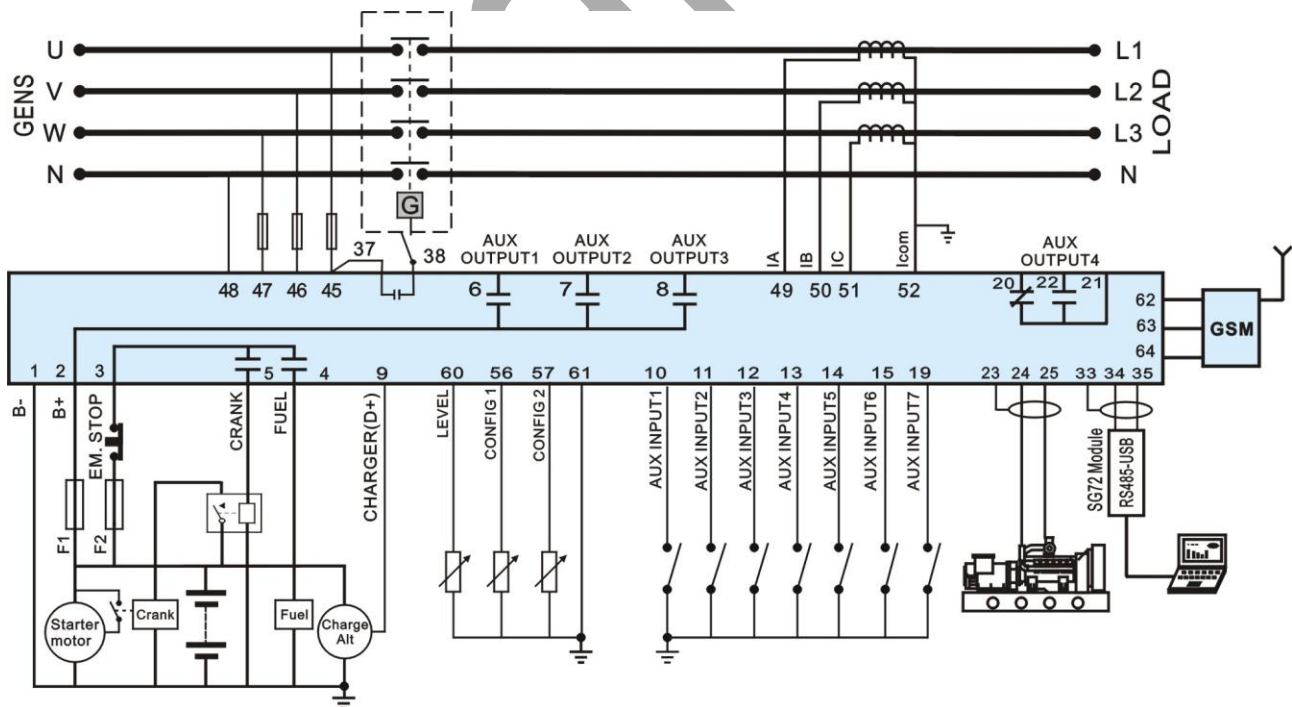
HGM9310 typical application diagram



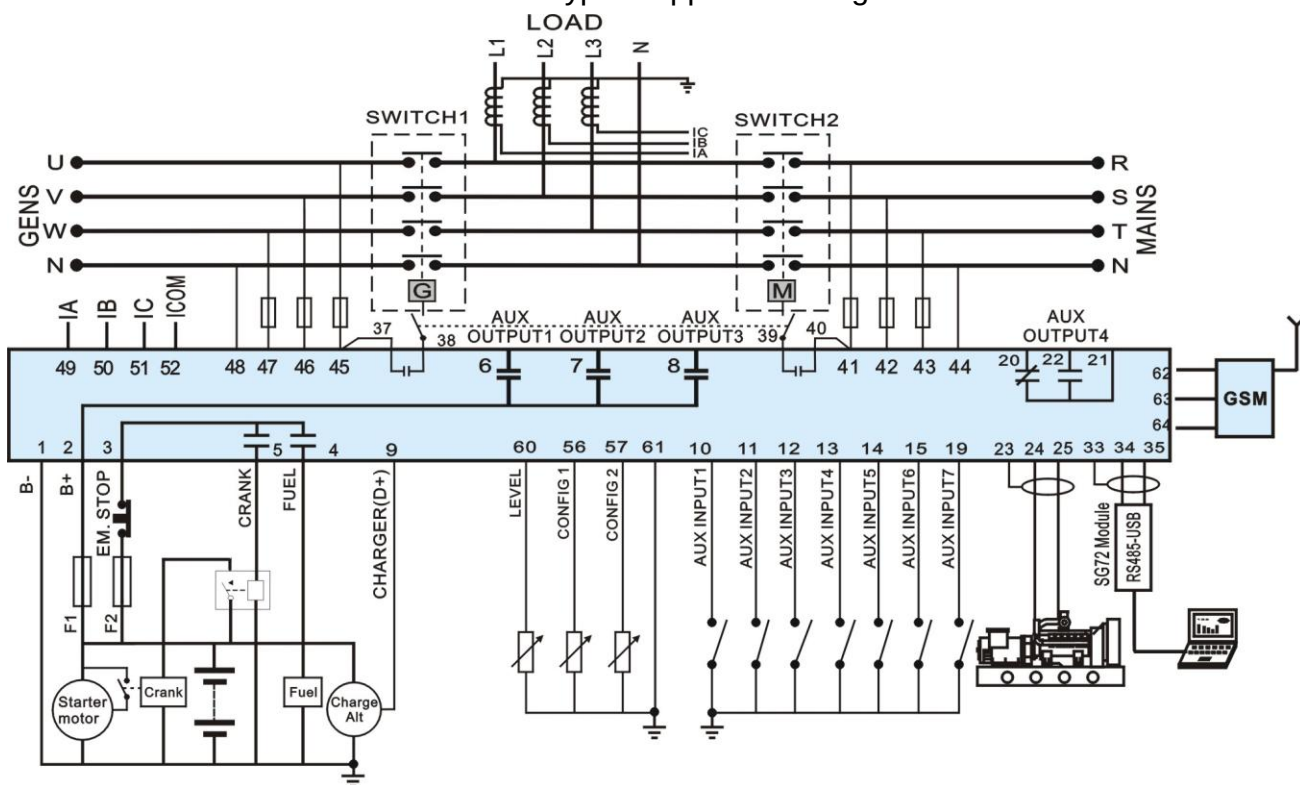
HGM9320 typical application diagram



HGM9410 typical application diagram

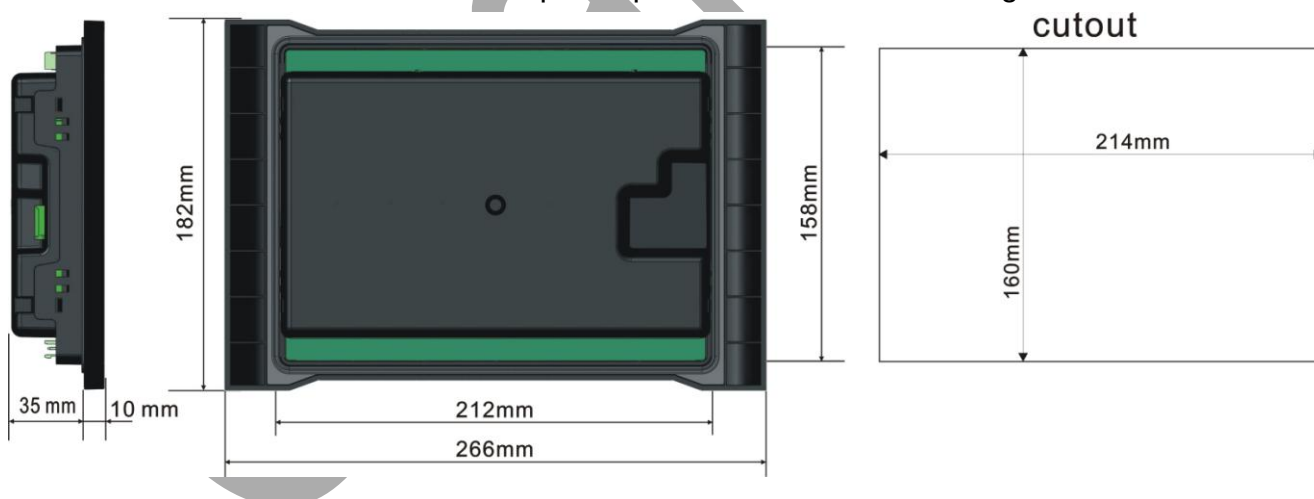


HGM9420 typical application diagram



13 INSTALLATION

Controller is panel built-in design; it is fixed by clips when installation. The controller's overall dimensions and cutout dimensions for panel, please refers to as following,



1) Battery Voltage Input

NOTE: HGM9000series controller can suit for widely range of battery voltage DC(8~35)V. Negative of battery must be connected with the engine shell. The diameter of wire which from power supply to battery must be over 2.5mm^2 . If floating charge configured, please firstly connect output wires of charger to battery's positive and negative directly, then, connect wires from battery's positive and negative to controller's positive and negative input ports in order to prevent charge disturbing the controller's normal working.

2) Speed Sensor Input

 **NOTE:** speed sensor is the magnetic equipment which be installed in starter and for detecting flywheel teeth. Its connection wires to controller should apply for 2 cores shielding line. The shielding layer should connect to No. 16 terminal in controller while another side is hanging in air. The else two signal wires are connected to No.17 and No.18 terminals in controller. The output voltage of speed sensor should be within AC(1~24)V (effective value) during the full speed. AC12V is recommended (in rated speed). When install the speed sensor, let the sensor is spun to contacting flywheel first, then, port out 1/3 lap, and lock the nuts of sensor at last.

3) Output And Expand Relays

 **CAUTION:** all outputs of controller are relay contact output type. If need to expand the relays, please add freewheel diode to both ends of expand relay's coils (when coils of relay has DC current) or, increase resistance-capacitance return circuit (when coils of relay has AC current), in order to prevent disturbance to controller or others equipment.

4) AC Input

Current input of controller must be connected to outside current transformer. And the current transformer's secondary side current must be 5A. At the same time, the phases of current transformer and input voltage must correct. Otherwise, the current of collecting and active power maybe not correct.

 **NOTE:** ICOM port must be connected to negative pole of battery.



WARNING! When there is load current, transformer's secondary side prohibit open circuit.

5) Withstand Voltage Test

 **CAUTION!** When controller had been installed in control panel, if need the high voltage test, please disconnect controller's all terminal connections, in order to prevent high voltage into controller and damage it.

14GSM SHORT MESSAGE ALARM AND REMOTE CONTROL

14.1GSM SHORT MESSAGE ALARM

When controller detects alarm, it will send short message to phone automatically.

 **NOTE:** All alarms about shutdown, trip and stop and trip will be sent to the pre-set phone. Warnings are sent to the phone according to the pre-set.

14.2GSM SHORT MESSAGE REMOTE CONTROL

Users send order message to GSM module, then controller will make actions according to this SMS order and pass back corresponding operations information. Controllers only execute the

orders by pre-set. Detail orders as following:

No.	SMS Orders	Re-back Information	Description
1	SMS GENSET	GENSET ALARM	When gen-set is stopping alarm.
		SYSTEM IN STOP MODE GENSET AT REST	At rest status in stop mode
		SYSTEM IN MANUAL MODE GENSET AT REST	At rest status in manual mode
		SYSTEM IN AUTO MODE GENSET AT REST	At rest status in Auto mode
		SYSTEM IN STOP MODE GENSET IS RUNNING	Running status in stop mode
		SYSTEM IN MANUAL MODE GENSET IS RUNNING	Running status in manual mode
		SYSTEM IN AUTO MODE GENSET AT RUNNING	Running status in Auto mode
2	SMS START	GENSET ALARM	Generator is shutdown alarm or trip alarm
		STOP MODE NOT START	Cannot start in stop mode
		SMS START OK	Start in manual mode
		AUTO MODE NOT START	Cannot start in auto mode
3	SMS STOP MODE	SMS STOP OK	Set as stop mode.
4	SMS MANUAL MODE	SMS MANUAL MODE OK	Set as manual mode.
5	SMS AUTO MODE	SMS AUTO MODE OK	Set as auto mode.
6	SMS DETAIL	Pass back information can be set via controller software.	Gets details information of gen-set.
7	SMS INHIBIT START	INHIBIT START OK	Set as start prohibit.
8	SMS PERMIT START	PERMIT START OK	Remove start prohibit.

▲**NOTE:** When sending orders, users need to follow SMS orders in above form and all the letters must be capital.

▲**NOTE:** Pass back information from SMS DETAIL including: working mode, mains voltage, generator voltage, load current, mains frequency, generator frequency, active power, apparent power, power factor, battery voltage, D+ voltage, water temperature, oil pressure, oil level, engine speed, total running time, genset status, and alarm status.

▲**NOTE:** Its national and area's cods must be added. e.g. China: 8613666666666

15 CONNECTIONS OF CONTROLLER WITH J1939 ENGINE

15.1 CUMMINS ISB/ISBE

Terminals of controller	Connector B	Remark
Fuel relay output	39	
Start relay output	-	Connect with starter coil directly.
Auxiliary output port 1	Expand 30A relay, battery voltage of 01,07,12,13 is supplied by relay	ECU power Set configurable output 1 as "ECU power".

Terminals of controller	9 pins connector	Remark
CAN GND	SAE J1939 shield	CAN communication shielding line(connect with ECU terminal only)
CAN(H)	SAE J1939 signal	Impedance 120Ω connecting line is recommended.
CAN(L)	SAE J1939 return	Impedance 120Ω connecting line is recommended.

Engine type: Cummins ISB

15.2 CUMMINS QSL9

It is suitable for CM850 engine control module.

Terminals of controller	50 pins connector	Remark
Fuel relay output	39	
Start relay output	-	Connect to starter coil directly.

Terminals of controller	9 pins connector	Remark
CAN GND	SAE J1939	CAN communication shielding line(connect with

	shield-E	ECU terminal only)
CAN(H)	SAE J1939 signal-C	Impedance 120Ω connecting line is recommended.
CAN(L)	SAE J1939 return-D	Impedance 120Ω connecting line is recommended.

Engine type: Cummins-CM850

15.3 CUMMINS QSM11 (IMPORT)

It is suitable for CM570 engine control mode. Engine type is QSM11 G1, QSM11 G2.

Terminals of controller	C1 connector	Remark
Fuel relay output	5&8	Outside expand relay, when fuel output, making port 5 and port 8 of C1 be connected.
Start relay output	-	Connect to starter coil directly.

Terminals of controller	3 pins data link connector	Remark
CAN GND	C	CAN communication shielding line(connect with ECU terminal only)
CAN(H)	A	Impedance 120Ω connecting line is recommended.
CAN(L)	B	Impedance 120Ω connecting line is recommended.

Engine type: Cummins ISB

15.4 CUMMINS QSX15-CM570

It is suitable for CM570 engine control mode. Engine type is QSX15.

Terminals of controller	50 pins connector	Remark
Fuel relay output	38	Oil spout switch
Start relay output	-	Connect to starter coil directly.

Terminals of controller	9 pins connector	Remark
CAN GND	SAE J1939 shield-E	CAN communication shielding line (connect with ECU terminal only)
CAN(H)	SAE J1939 signal-C	Impedance 120Ω connecting line is recommended.
CAN(L)	SAE J1939 return-D	Impedance 120Ω connecting line is recommended.

Engine type: Cummins QSX15-CM570

15.5 CUMMINS GCS-MODBUS

It is suitable for GCS engine control mode. Use RS485-MODBUS to read information of engine. Engine types are QSX15, QST30, QSK23 / 45/60/78 and so on.

Terminals of controller	D-SUB connector 06	Remark
Fuel relay output	5&8	Outside expand relay, when fuel output, making port 05 and 08 of the connector 06 be connected.
Start relay output	-	Connect to starter coil directly.

Terminals of controller	D-SUB connector 06	Remark
RS485 GND	20	CAN communication shielding line(connect with ECU terminal only)
RS485+	21	Impedance 120Ω connecting line is recommended.
RS485-	18	Impedance 120Ω connecting line is recommended.

Engine type: Cummins QSK-MODBUS, Cummins QST-MODBUS, Cummins QSX-MODBUS

15.6 CUMMINS QSM11

Terminals of controller	OEM connector	Remark
Fuel relay output	38	
Start relay output	-	Connect with starter coil directly.
CAN GND	-	CAN communication shielding line(connect with controller's terminal only)
CAN(H)	46	Impedance 120Ω connecting line is recommended.
CAN(L)	37	Impedance 120Ω connecting line is recommended.

Engine type: J1939 common used

15.7 CUMMINS QSZ13

Terminals of controller	OEM connector of engine	Remark
Fuel relay output	45	
Start relay output	-	Connect to starter coil directly.
Configurable output 1	16&41	Set as idle speed control, normal open output. Let 16 connect to 41 during high speed running

		of controller via external expansion relay.
Configurable output 2	19&41	Set as pulse raise speed control, normal open output. Let 19 connect with 41 for 0.1s during high speed warming of controller via external expansion relay.
CAN GND	-	CAN communication shielding line(connect with controller's this terminal only)
CAN(H)	1	Impedance 120Ω connecting line is recommended.
CAN(L)	21	Impedance 120Ω connecting line is recommended.

Engine type: common J1939.

15.8DETROIT DIESEL DDEC III/IV

Terminals of controller	CAN port of engine	Remark
Fuel relay output	Expand 30A relay, battery voltage of ECU is supplied by relay.	
Start relay output	-	Connect to starter coil directly.
CAN GND	-	CAN communication shielding line(connect in ECU this terminal only)
CAN(H)	CAN(H)	Impedance 120Ω connecting line is recommended.
CAN(L)	CAN(L)	Impedance 120Ω connecting line is recommended.

Engine type: common J1939.

15.9DEUTZ EMR2

Terminals of controller	F connector	Remark
Fuel relay output	Expand 30A relay, battery voltage of 14 is supplied by relay. Fuse is 16A.	
Start relay output	-	Connect to starter coil directly.
-	1	Connect to battery negative pole.
CAN GND	-	CAN communication shielding line(connect in ECU this terminal only)
CAN(H)	12	Impedance 120Ω connecting line is recommended.
CAN(L)	13	Impedance 120Ω connecting line is

		recommended.
--	--	--------------

Engine type: VolvoEDC4

15.10JOHN DEERE

Terminals of controller	21 pins connector	Remark
Fuel relay output	G,J	
Start relay output	D	
CAN GND	-	CAN communication shielding line(connect in ECU this terminal only)
CAN(H)	V	Impedance 120Ω connecting line is recommended.
CAN(L)	U	Impedance 120Ω connecting line is recommended.

Engine type: John Deere

15.11MTU MDEC

It is suitable for MTU engines, 2000 series and 4000series.

Terminals of controller	X1 connector	Remark
Fuel relay output	BE1	
Start relay output	BE9	
CAN GND	E	CAN communication shielding line(connect with ECU terminal only)
CAN(H)	G	Impedance 120Ω connecting line is recommended.
CAN(L)	F	Impedance 120Ω connecting line is recommended.

Engine type: MTU-MDEC-303

15.12MTU ADEC

It is suitable for MTU engine with ADEC (ECU8) and SMART module.

Terminals of controller	ADEC (X1port)	Remark
Fuel relay output	X1 10	X1 Terminal 9 Connected to negative of battery
Start relay output	X1 34	X1 Terminal 33 Connected to negative of battery

Terminals of controller	SMART (X4 port)	Remark
CAN GND	X4 3	CAN communication shielding line(connect with

		controller's terminal only)
CAN(H)	X4 1	Impedance 120Ω connecting line is recommended.
CAN(L)	X4 2	Impedance 120Ω connecting line is recommended.

Engine type: MTU-ADEC

15.13 MTU ADEC (SAM MODULE)

It is suitable for MTU engine with ADEC (ECU7) and SAM module.

Terminals of controller	ADEC (X1port)	Remark
Fuel relay output	X1 43	X1 Terminal 28 Connected to negative of battery
Start relay output	X1 37	X1 Terminal 22 Connected to negative of battery

Terminals of controller	SAM (X23 port)	Remark
CAN GND	X23 3	CAN communication shielding line(connect with controller's terminal only)
CAN(H)	X23 2	Impedance 120Ω connecting line is recommended.
CAN(L)	X23 1	Impedance 120Ω connecting line is recommended.

Engine type: common J1939

15.14 PERKINGS

It is suitable for ADEM3/ ADEM4 engine control module. Engine type is 2306, 2506, 1106, and 2806.

Terminals of controller	Connector	Remark
Fuel relay output	1,10,15,33,34	
Start relay output	-	Connect to starter coil directly.
CAN GND	-	CAN communication shielding line(connect in ECU this terminal only)
CAN(H)	31	Impedance 120Ω connecting line is recommended.
CAN(L)	32	Impedance 120Ω connecting line is recommended.

Engine type: Perkins

15.15SCANIA

It is suitable for S6 engine control module. Engine type is DC9, DC12, and DC16.

Terminals of controller	Connector B1	Remark
Fuel relay output	3	Connect to engine ignition lock.
Start relay output	-	Connect to starter coil directly.
CAN GND	-	CAN communication shielding line(connect with controller's this terminal only)
CAN(H)	9	Impedance 120Ω connecting line is recommended.
CAN(L)	10	Impedance 120Ω connecting line is recommended.

Engine type: Scania

15.16VOLVO EDC3

Suitable engine control mode is TAD1240, TAD1241, and TAD1242.

Terminals of controller	"Stand alone" connector	Remark
Fuel relay output	H	
Start relay output	E	
Configurable output 1	P	ECU power Set configurable output 1as "ECU power"

Terminals of controller	"Data bus" connector	Remark
CAN GND	-	CAN communication shielding line(connect to controller's this terminal only)
CAN(H)	1	Impedance 120Ω connecting line is recommended.
CAN(L)	2	Impedance 120Ω connecting line is recommended.

Engine type: Volvo

▲NOTE: When this engine type is selected, preheating time should be set to at least 3 seconds.

15.17VOLVO EDC4

Suitable engine types are TD520, TAD520 (optional), TD720, TAD720 (optional), TAD721, TAD722, and TAD732.

Terminals of controller	Connector	Remark
-------------------------	-----------	--------

Fuel relay output	Expanded 30A relay, and relay offers battery voltage to terminal 1. Fuse is 16A	
Start relay output	-	Connect to starter coil directly.
	1	Connected to negative of battery.
CAN GND	-	CAN communication shielding line(connect with controller's this terminal only)
CAN(H)	12	Impedance 120Ω connecting line is recommended.
CAN(L)	13	Impedance 120Ω connecting line is recommended.

Engine type: VolvoEDC4

15.18VOLVO-EMS2

Volvo Engine types are TAD734, TAD940, TAD941, TAD1640, TAD1641, and TAD1642.

Terminals of controller	Engine's CAN port	Remark
Configurable output 1	6	ECU stop Set configurable output 1as "ECU stop".
Configurable output 2	5	ECU power Set configurable output 1as "ECU power".
	3	Negative power
	4	Positive power
CAN GND	-	CAN communication shielding line(connect to controller's this terminal only)
CAN(H)	1(Hi)	Impedance 120Ω connecting line is recommended.
CAN(L)	2(Lo)	Impedance 120Ω connecting line is recommended.

Engine type: Volvo-EMS2

▲ NOTE: When this engine type is selected, preheating time should be set to at least 3 seconds.

15.19YUCHAI

Suit for Yuchai common rail electrically controlled engine.

Terminals of controller	42 pins connector of engine	Remark
Fuel relay output	1.40	Connect to ignition switch of engine.
Start relay output	-	Connect to starter coil directly.
CAN GND	-	CAN communication shielding line(connect with

		controller's this terminal only)
CAN(H)	1.35	Impedance 120Ω connecting line is recommended.
CAN(L)	1.34	Impedance 120Ω connecting line is recommended.

Battery	2 pins connector of engine	Remark
Negative power	1	Wire diameter is 2.5mm ² .
Positive power	2	Wire diameter is 2.5mm ² .

Engine type: BOSCH

15.20WEICHA

Suit for Weichai common rail electrically controlled engine.

Terminals of controller	Connector	Remark
Fuel relay output	1.40	Connect to ignition switch of engine.
Start relay output	1.61	
CAN GND	-	CAN communication shielding line(connect with controller's this terminal only)
CAN(H)	1.35	Impedance 120Ω connecting line is recommended.
CAN(L)	1.34	Impedance 120Ω connecting line is recommended.

Engine type: GTSC1

▲NOTE: If there is any question of connection between controller and ECU communication, please feel free to contact Smartgen service.

16FAULT FINDING

SYMPTOM	POSSIBLE REMEDY
Unit is inoperative	Check battery and wiring to unit. Check DC fuse.
Unit shutdown	Check the water/cylinder temperature is too high or not; Check DC fuse.
Unit trips on emergency stop	Check the function of emergence stop button is correct or not; Check a positive is present on this input. Check wiring on emergency stop switch or switches.
Low oil pressure fault operates after engine has fired.	Check oil pressure switch and wiring.

HGM9200/9300/9400 Series Gen-set Controller

High water temperature fault operates after engine has fired.	Check water temperature switch and wiring.
Shutdown Alarm during running	Check relevant switch and wiring. Check relevant programmable input port.
Fail to start is activated after multi-attempts	Check wiring and operation of fuel solenoid. Check battery. Check wiring and speed sensor. Refer to engine manual.
Starter motor inoperative	Check wiring to starter motor. Check battery supply.
Gen-set running while ATS not transfer	Check ATS. Check wiring between ATS and controller.
RS485 communication is abnormal	Check wiring. Check RS485's connections of A and B is reverse connect or not; Check RS485 transfer module whether damage or not; Check communication port of PC whether damage or not.
ECU communication failed	Check wiring. Check CANBUS's connections of H and L is reverse connect or not; Check ECU whether damage or not; Check if the type of engine is correct; Check if the output port of ECU is correct or not.
ECU warning or shutdown	Refer to alarm screen to get information. Check engine according to contents if there is concrete contents. Refer to <i>ENGINE MANUAL</i> according to SPN code to get information if there is no concrete content.